

OCTOBER, 1950

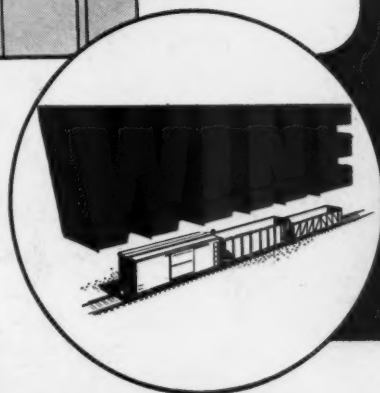
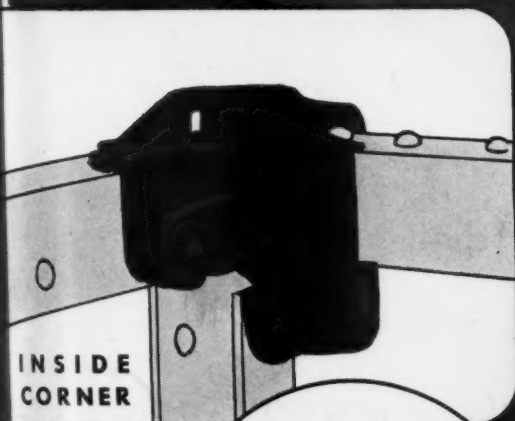
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VOLUME 124

No. 10

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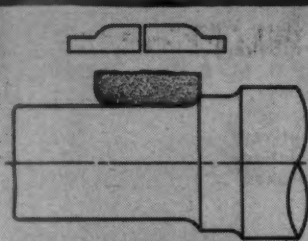
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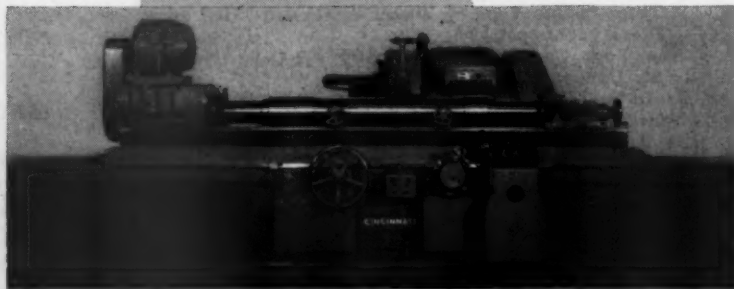


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Drawing of profile cam and corresponding radius produced on wheel and work. Cams for this installation can be easily interchanged; cover a range of $\frac{3}{4}$ ", 1" and $1\frac{1}{2}$ " radii.



CINCINNATI FILMATIC 16" x 96" Plain Grinding Machine with profile wheel truing equipment and loading cradles to facilitate grinding operations on railroad car wheel axles. Complete data in new catalog No. G-599.

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Wheel Shop Tool Engineering

A.C.F. studies fundamentals of wheel shop tooling
and improves both production and quality of work

AT THE end of the war the American Car & Foundry Company made an exhaustive study of the type of machinery and shop practice methods best suited to improving the quality, uniformity and productivity of their wheel and axle shops. The first phase of the study compared the relative economics of highly refined conventional machinery with radically new designs that stemmed from wartime high-output shell turning. The results showed that the more economical course to follow was to employ conventional machinery of the general type used in railroad shops, but with many refinements and improvements added by A.C.F. to provide better tooling, better feed and speed control, greater accuracy and less operator fatigue.

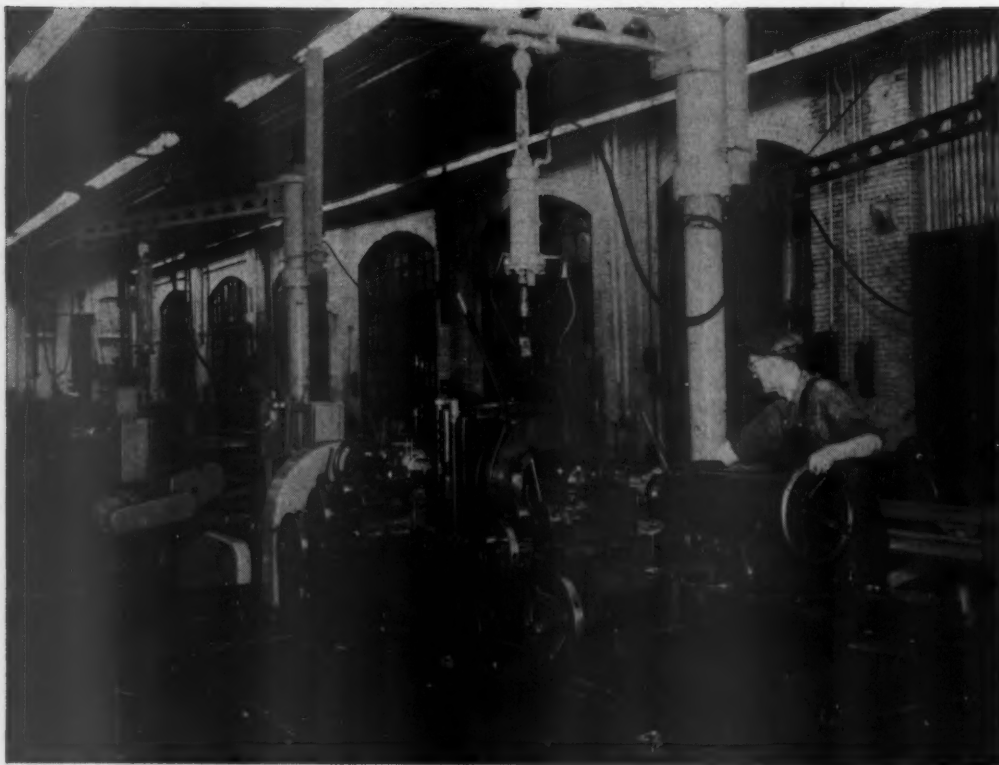
The second, and equally important, phase of the study was directed toward improving the shop methods involved in machining, miking and assembling the wheels and axles. The two phases together comprise a succession of detail developments which produce highly uniform results at a substantial reduction in cost over former methods. The entire program is typified by the wheel and axle shop at Madison, Ill., which is described in detail in the remainder of this article.

Improved Shop Practices

Wheels and axles are stored inside the shop so that the metal will be at a uniform temperature for turning. The uniformity of temperature improves both the ac-



Over-all view of A.C.F.'s Madison wheel shop showing the indoor axle storage in the foreground, the axle production line in the right background, the wheel boring area in the left background, and the excellent illumination throughout the shop



The center drive axle lathe showing the heavy roller bearing tailstock quill and the ease with which the lathe can be loaded by the roller bearing jib crane

curacy and the finish of the machined wheel or axle, and it eliminates such difficulties as the coolant freezing on the axle during cold weather. When the semi-finish machining has been completed a constant amount of stock, .010 in., is left on all axles to be removed in the finishing operation. This light uniform finishing cut increases accuracy and gives a surface that submits to good burnishing.

The axle lathes are the center-drive type with right and left hand carriages. All have large roller-bearing spindles with the tailstock quills about twice the diameter of those on the old friction-bearing machines. This type of lathe has been installed rather than the heavy end-drive type used in shell production during the war for several reasons. While one of the latter would have met the requirements at Madison and would have an output equal to two center-drive semi-finish lathes which are installed on each side of the assembly line, the cost of the end-drive lathe is high and there would be no reserve in the event of a stoppage of the machine. As two of the center-drive lathes have a margin above the output requirements of the shop they are entirely adequate. The center-drive lathe further avoids springing the axle and does not produce irregularities in the surface of the axle ends which may pick up waste.

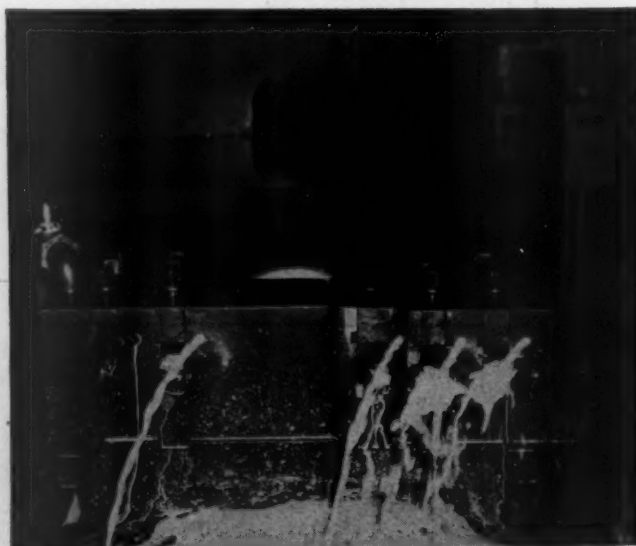
Tool and Fixture Design

The design of tools and fixtures has been scientifically determined. A number of different alloys have been tested and selection made accordingly. For the semi-finish cut on axles, so termed because axles are delivered to the shop already rough turned, a special block has been designed which positions each of the several tools exactly so that all dimensions are repeated without measurement by the operator. Through the use of this block in conjunction with gauge-ground tools, the journal, dust collar and wheel seat length as well as the radii of the fillets are all held uniformly to the specified di-

mension and contour. Only one adjustment is made—the movement of the cross slide to the proper diameter.

The semi-finish turn tool block clamps each of the four tools securely in position for the correct diameter of the portion of the axle turned by each, and it correctly spaces the fixed lateral dimensions. It offers four principal advantages:

1. The size of the tool bit can be reduced from 1½ in. square to 1 in. square. This avoids a large inventory as the 1-in. tools are stock items easily purchased in any part of the country.
2. The overhang of the tool is rigidly supported.
3. The tool change has been simplified and speeded



Rifle holes drilled in the axle lathe semi-finish tool block direct the flow of coolant at the point of cutting and provide the operator with an unobstructed view of the cutting

The dual set-up of wheel borers which are operated by one man assisted by a wheel roller



up. Respacing tools to keep lateral dimensions is not necessary.

4. The application of cutting compound is accurately accomplished through passages drilled in the tool block in such a manner that liquid is always directed on the point of cutting. This not only improves the finish of the axle and the life of the tool but it affords the operator an unobstructed view of the cutting operation.

The most desirable coolant flow was determined by high-speed motion pictures taken at 3,500 frames per second. The type of coolant to be used was carefully selected because it was felt that it had an important bearing on long tool life as well as finish. The emulsifiable heavy duty compound selected has high anti-welding properties to reduce in so far as possible any tendency for the chip to weld to the tool and thereby reduce the quality of the finish. The rake and clearance angles of

the tools, and the height above the axle center at which the cut is taken, were arrived at by experimentation to get the best speed, finish and tool life.

The holder for the finish-turn tools is functionally similar to the semi-finish tool block. The former differs from the latter in that small clamp-on tools are used with the finish-tool holder. The clamp-on tools were selected for this operation to avoid waste and to simplify grinding, which can be done on these tools by the use of a fixture set at the proper angle. The finishing tool holder is so shaped that rake is obtained by the mounting of the tool and does not have to be ground into the tool.

Selection and Care of Tools

The 1-in. square tools used on the semi-finish operation are not used for the finishing operation because the width could not be reduced below $1\frac{3}{8}$ in. without



Foot operation of the mounting press gives close control of the mounting operation and allows the operator to concentrate his attention on the use of his gauges

sacrificing the desired finish. A second reason for the different types of tools used in the tool operation is that the semi-finish tool block is actually a tool holder. The tools, which have an original length of 7 in., can be used down to 2½ in. in length. Thus the large one-piece tools can be used in the semi-finish operation with only a small percentage of waste. The clamp-on tools used for the finish operation have an original length of 3 in. and can be used down to 1½ in.

The tools for the semi-finish operation are of cast alloy while the clamp-on tools for the finishing operation are of high-speed steel. The tools for the semi-finish operation have a 10-deg. clearance angle, a 12 deg. side rake and are mounted ¼ in. above the center of the axle. The high-speed-steel finishing tools are mounted ¾ in. above the axle center, have a back rake angle of 5 deg. built into the tool holder, and a clearance angle of 30 deg. ground into the tool. The four semi-finish cast alloy tools—wheel seat, dust guard, journal and end collar—average about 25 axles per grind. The finishing tool life varies from 20 axles per grind on the journal to 80 on the wheel seat.

The full cycle of wheel boring is automatically controlled for both chilled wheels and steel wheels, one man operating two boring mills with the assistance of a wheel roller to keep him supplied. Both mills are roller-bearing equipped and have a maximum table speed of 125 r.p.m. to permit the usage of carbide tools. Chilled wheels are rough and finished, turned in one pass with two carbide tools. Steel wheels are rough turned at high speed with carbide tools; then the machine automatically reduces speed and feed for the finishing operation with high-speed steel. This produces a surface that lends itself to press fitting.

The grinding of all tools has been taken out of the hands of the machine operator and placed in a grinding room well equipped with modern grinding facilities, fixtures and gauges to produce proper clearance and tool profile. A trained tool grinder keeps all operators supplied with uniform tools. A special curve has been

developed to provide the proper profile on axle fillet turning tools so that when mounted above the center of the axle a true radius will be turned where needed.

The grinding equipment has been selected to accommodate the specific task required in a wheel shop. Full equipment for carbide tools and high-speed tools is installed. All master gauges for wheel mounting, wheel wear micrometers and snap gauges are kept in cabinets in this room. The room also houses hydraulic master gauges for the wheel press hydraulograph.

Fitting the Wheels

Direct reading micrometers for measuring the finished bore of wheels were built to A.C.F. specifications to eliminate the old method of depending on an individual's touch. A series of five colors on the dial in increments of two-thousandths of an inch permits grouping and mating with axles of a like color group. A companion outside micrometer for grouping wheel seats by diameter is likewise direct reading in color groups. The wheels to be fit by the color gauges are bored to a total maximum tolerance of .005 in., or .0025 in. plus or minus.

The five colors used on each micrometer are white, blue, red, yellow and black in that order. From the extreme edge of the white to the extreme edge of the black is .010 in. The wheels and axles are measured directly by color, the interference for the wheel press being included in the matching of the color groups. Thus when a black axle is read on the outside micrometers and a black wheel bore measured by the inside micrometers, the two are ready for pressing.

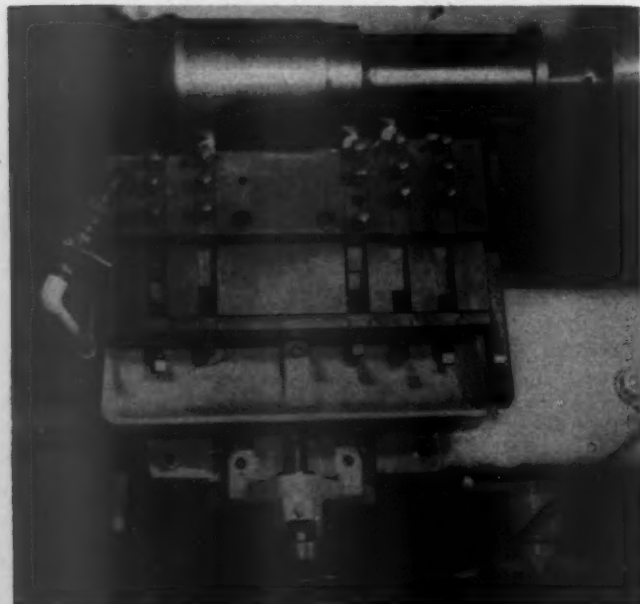
The wheels are mounted to the axles with a 400-ton press built to A.C.F. specifications for high production. Operation of the press is by foot control valves to allow the operator to observe and control the approach of the centering gauge to the scribed mark on the axle with maximum accuracy. Instant stoppage of motion and inching is easily attained. The press is powered by a positive-displacement rotary pump which gives rapid approach, variable pressing speeds and rapid retraction.

The press has been reduced to basic simplicity with the embodiment of such essentials as are necessary to give full control of operation. Pressing speeds can be adjusted to give the optimum performance, and the operator's activities at the press have been concentrated on the use of his gauges. Manipulation of hand valves and pump check valves has been eliminated. This has had a marked effect in reducing overpressing and tread gauge error.

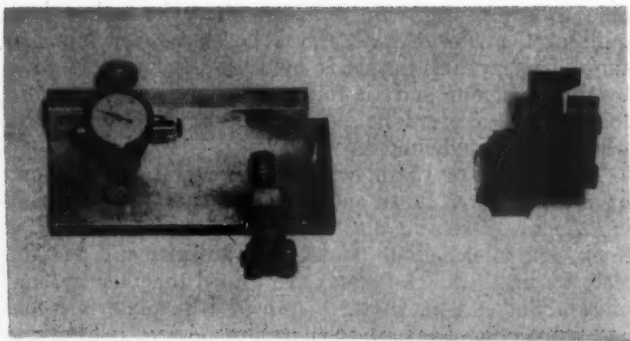
Smooth pressing action has been obtained by a pump that delivers up to 3,000 lb. per sq. in. at a uniform non-pulsating flow. The smooth flow eliminates hammering the wheel on as occurred with the old triplex reciprocating plunger pumps. The smoothness of the action is reflected in the even approach to peak tonnage of the hydraulograph curve on the wheel record tape.

Hand operations of the press are confined to steps either preceding the pressing operation or following the pressing operation. Push buttons at the center of the press within easy reach of the operator control movements of the pusher blocks which alternately engage the ends of the axle and operates the shifting cylinder that centers the finished mounted wheel set for ejection. This air activated pusher places the mounted wheel set in line with the discharged track.

For misfits, of which there are few because of close control, the press has a press-off yoke on one end. If the wheel at the end opposite to the press-off yoke requires removal, the wheel set is reversed on a turntable.



Top view of the semi-finish tool block showing how the tools are clamped in correct lateral relationship with each other and how individual adjustments can be made.



The gauge for grinding and setting carbide-tipped tools

Features of the Shop

Several factors of the shop design and equipment contribute to high production and good work. The lighting is supplied by fluorescent tubes suspended from the ceiling. It is distributed to assure a minimum of 25 foot-candles of shadowless light along the entire machine line. Heating is supplied by overhead blower units, and shop temperatures are maintained at the ideal for wheel shop work. This has been found to have a marked influence on the quality and uniformity of the finished product.

Specially designed self-supporting jib cranes with roller bearings facilitate loading and unloading lathes. The off-set grab hooks for loading the axles have been made of heat-treated alloy steel to lighten the weight. The operator handles 1,100 lb. axles with ease. The reduction of operator fatigue tends to improve his ability to maintain better quality. Pneumatically operated hoists load and unload the boring mills with a minimum of effort. By observing proper operating sequence the operator raises and lowers incoming and outgoing wheels while the mill is at work. As the full boring cycle is automatically controlled, loading and unloading is easily done while the wheels are being bored.

All lathes are checked weekly for taper and rotundity. Necessary adjustments are made and records kept. Boring mills are likewise checked weekly and records kept. These are checked by a master wheel for rotundity and taper of the bore. Chuck jaw alignment is also checked. The hydraulograph is checked every 30 days. Production gauges are compared with master gauges and limit wear gauges.

The Production Line

One car wheel boring area and one axle machining line supply two assembly tracks. The production of the two areas is sufficient to supply mounted wheel sets for assembly tracks even when different types of cars are on each track requiring different wheel and axle sizes.

Axles are unloaded directly from a box car to the stockpile within the shop by a 1-ton high-speed crane. They are moved from one operation to the next by rolling on a pair of properly spaced rails about 2 ft. high which support the axles on the wheel seats. One semi-finishing axle lathe is located on each side of the loading rack at its lower end, and one finishing lathe on each side at the upper end. One old lathe is retained beyond the finishing lathe. It is located opposite the burnishing machine. The purpose of retaining an old machine is to avoid interruptions to the regular production line.

When a defect is found in an axle, the axle is transferred to the old lathe to see whether the defect will turn out. In the meantime regular production on the two pair of modern axle lathes continues.

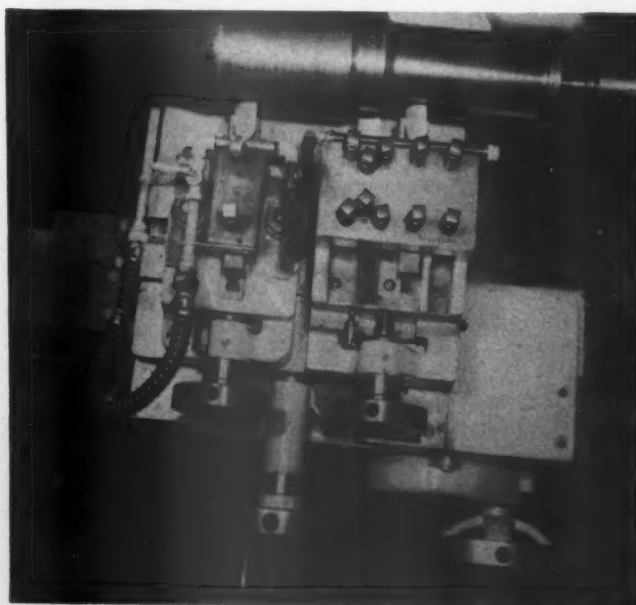
Lathes of the same function are located on opposite sides of the rack so that cross feeding is possible to avoid shutting down the entire line; one side can continue operation.

The first step in machining the axle after it has been unloaded into the shop is to prepare the center by removing the rust and dirt. The axle is loaded by a jib crane to one of the two semi-finishing lathes located on each side of the rack. After completion of the semi-finish cut the axle is moved, returned to the rack that runs along the axle portion of the production line. When the finish turn lathe operator is ready for the axle he loads it from a jib crane located at either of the two finishing lathes which are on each side of the rack. By this arrangement either the right or left side semi-finishing lathe can feed either the right or left side finishing lathe. The axle arrives at the finishing lathe turned to a snap gauge tolerance of .010 in. and with a small and uniform amount of metal to be removed in the finishing cut.

Burnishing is done in an end-drive burnishing lathe since the work load is not great and therefore requires only a comparatively light end pressure. Centering and chucking is done with hydraulic pressure. Stellite burnishing rolls apply pressure from both sides simultaneously and obtain lateral travel by a rack and pinion through a slip clutch. When the axles are finished and ready for inspection they are dimensionally checked and observed for finish and defects on an inspection rack.

The wheel handling area is adjacent to the axle machining line. Wheels are unloaded from box cars on a depressed track with the platform height at the floor level of the car to permit the wheel to be rolled directly off. This hand movement, however, is due to be replaced soon with lift truck handling of the wheel for the 40-ft. distance from the car to the boring mill storage.

A wheel fitter coordinates the work of the boring mill with the axle lathe. Depending on whether the axle men or the wheel man is ahead, this fitter notes which side



The clamped-on tools in place in the finishing-cut tool holder

of the tolerance the leading man is working on and has the other man do his work on the same side of the tolerance. In other words, if the axle lathe is ahead of the boring mill and the axles are running about .002 in. large, the fitter will also have the wheels bored .002 in. large.

The wheels and axles are moved to the mounting press for pressing by rolling the fitted assembly.

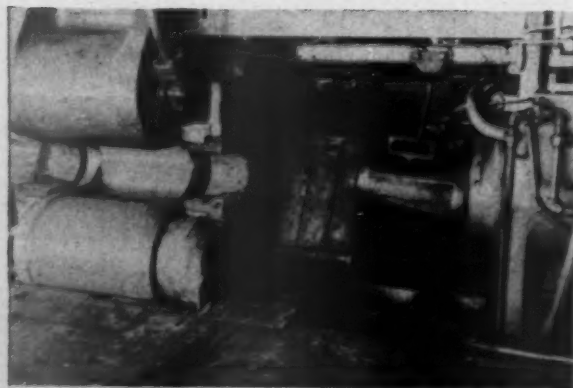
Care is taken in compounding the boiled linseed oil and white lead which are applied to the contact surfaces of the wheel and axle because the consistency and quality of this compound has been found to have a definite effect on the mounting tonnage. This, coupled with maintaining the proper wheel seat finish on the axle and observing correct interference dimensions, has resulted in consistently obtaining proper mounting tonnage.

The mounting press is equipped with small slides on the floor which have profile sockets for holding the wheels to facilitate easy movement of the wheel over the axle. Damage during the pressing operation is prevented by using metal reinforced journal guards over the axle. During the pressing operation the tread gauge is the heaviest tool the operator has to lift. This reduction of operator effort plus the good machine control, freedom from obstructions and good lighting enables the operator to do good tread gauging easily.

The wheel pairs are ejected from the press and rolled to the turning jack position where the axle ends are polished free of any center burrs that might cause a pickup of waste. Here also all excess wheel seat compound is wiped off. The turning jack which automatically elevates the wheel sets so that they can be turned has a means of switching either directly to the truck shop or through the wheel tread grinder where this operation is specified. Another jack beyond this door has an offset head which permits alternate placement on the dual storage track. All chilled cast wheels are ground, and steel wheels are ground when requested. Grinding is done on a high-speed wheel tread grinder of A.C.F.'s latest design.

Leveling Wheel Sets for Dismounting

A simple, easily made arrangement for leveling wheel sets during demounting operations that is readily adjust-



Easily adjustable support for wheel sets to align the axle with the press ram while demounting the wheels

able to compensate for different size wheels has been built at the New York Central Beech Grove, Ind., car shop. The leveling device is made of steel plates joined by hinges at one end; it folds over like a writing tablet to form the desired height of support for the pair of wheels being demounted.

The plates are 15 in. wide by about 30 in. long and have a 20-degree taper on the free end to facilitate rolling the wheel sets in place. The bottom plate is 1½ in. thick, the intermediate plate ¾ in. thick, and the top plate ⅝ in. thick. The plates are joined together by, and pivot about, a 1-in. shaft. A stop of 1-in. plate is incorporated on the back of the leveling device to limit the degree of fold-back travel of the plate or plates in excess of those needed to center the axle with the press ram.

The leveling device is mounted permanently in place to the head of the demounting press through an angle section. It moves back and forth with the cross head on four rollers which travel on the tie beams.

Removing Scrap Iron from Punch Press

Scrap is removed continuously as cut from a shear at Despatch Shops, Inc., East Rochester, New York, by means of a continuous conveyor belt. Time is saved and the risk of accidents reduced because the machine conveyor removes the pieces of metal left over from the shearing operation direct to a point remote from the punches.

The conveyor is made from strap iron 1¼ in. by ½ in. by 9 ft. (the width of the shear). It is driven by and held together by an endless chain, which also serves to join the lengths of strap iron. The strap iron slats are joined to the endless chain through angle clips and are held by machine screws.

The conveyor runs continuously and is driven by a 3-hp. motor through reduction gearing. Small pieces of scrap drop directly into buckets, while larger pieces are allowed to drop to the floor and are removed later by hand.



Continuous conveyor for removing scrap pieces from a punch press

New Trains for "Sunset Limited"

All new Budd-built cars are installed by the Southern Pacific—Car bodies of girder construction—Train power generated at 110 volts

THE Southern Pacific has completely re-equipped its "Sunset Limited," operating between Los Angeles, Calif., and New Orleans, La., with new trains of 15 cars each. When these trains went into service on August 20, new 42-hr. schedules were inaugurated for the 2,070-mile run in each direction, a reduction of five hours from the previous eastbound scheduled and three and one-half hours from the previous westbound schedule. All of the cars are of stainless-steel construction, designed and built by the Budd Company, Philadelphia, Pa., and styled by John Harbeson.

Each train, from front to rear, consists of one baggage-postal car; one baggage-dormitory car; one 48-passenger divided chair car with conductor's space and a newsstand; three 44-passenger chair cars; one "Pride of Texas" coffee-shop-lounge car with seats for 46; one "Audubon" diner with tables for 48; one "French Quarter" lounge car which seats 39, and six sleepers, each with 10 roomettes and six double bedrooms.

The Car Structures

The cars are built of stainless-steel structural members and sheathing, with the exception of the end underframe structures which are of low-alloy high-tensile steel. The stainless steel is assembled by the Budd Shotweld process of controlled-energy welding; the end underframe structures, by arc welding. Unlike most of the cars built previously by Budd, the bodies of which were of truss construction, these cars are of modified girder construction. The sides are made up of stainless-steel posts and load-carrying outside sheathing.

The center sill comprises two special side channels and a bottom closing member and has a section area of 12.2 sq. in. Transverse floor members of Z-section, extending from side sill to side sill, are closely spaced between the bolsters. The bottom flanges are extended so that each overlaps the adjacent section to which it is welded to form a closed subfloor. This subfloor is welded to the top of the center sill. Located at the ends of the middle third of the car are two single-web crossbearers which tie the side sills and the center sill together and, with heavier section floor pans adjoining them, serve as floor stiffeners.

The side sill is a special flanged channel which encloses the ends of the floor pans. An angle flange extending down from the end of the lower leg of the channel and forming a part of the side sill supports the inside flange of the short vertical skirt pans.

The end underframe unit includes the draft sills, bolster and the steel casting which combines the end sill and the coupler carrier support. The arc-welded structure at the intersection of the bolster and draft sills provides a center filler which gives continuity to the webs and flanges of both members. The ends of the body bolster are welded to the side sills. Extensions of the unit in-

board of the bolsters are plug-welded and riveted to the main center sill.

The subfloor, which is of heavier gauge material between the bolsters and the ends of the car, is welded to the draft sills and forms a transverse girder which, together with the bolster, distributes some part of collision loads to the side members.

Except in the baggage-postal cars, bolsters are box section. Those in the baggage-postal cars are double I-beams.

A stainless-steel Z-member, the vertical flange of which is welded to the inside faces of the side posts, connects the side frame to the side sill. This is supplemented by a stainless-steel plate welded to the outside of the posts for a height of about 8 in. and to the outside face of the side sill.

The load-carrying side sheets below the windows are stainless steel, formed with wide spaced longitudinal corrugations which support light-gauge narrow fluted panels inserted in the spaces between the nodes of the corrugations so that no change has been made in the finished appearance of the car. The pier panels are sheathed with flat sheets of stainless steel of relatively heavy gauge. These are reinforced with vertical stiffeners. The con-

PRINCIPAL DIMENSIONS AND WEIGHTS OF THE "SUNSET LIMITED" CARS

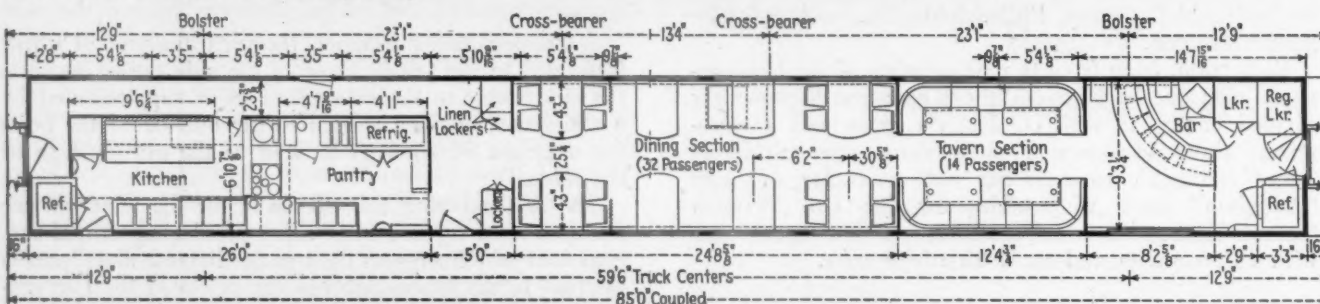
Dimensions, ft.-in.:	
Length, coupled.....	85-0
Length, center to center of bolsters.....	59-6
Width (over side sills, including molding).....	10-7/16
Height, top of rail over roof.....	13-6 1/4
Height, top of rail to top of plywood floor.....	4-4 1/2
Weights, ready to run, lb.:	
Baggage-postal.....	137,600
Baggage-dormitory.....	126,200
Divided chair car.....	128,480
44-passenger chair car.....	124,580
"Pride of Texas" coffee-shop-lounge.....	143,400
Dining car.....	143,280
"French Quarter" lounge car.....	129,780
Sleeping cars.....	137,600



A battery rolled out from under the car for inspection



The "Pride of Texas" coffee-shop-lounge



The "Pride of Texas" coffee-shop-lounge features leather decorated with authentic brands, steer heads, and Mexican spurs

tinuous belt rail is shaped to form the top retainer of the upper fluted panel below the windows. A side-sill skid-rail trim moulding is riveted on.

Behind the top rail and belt rail are continuous heavy gauge plates which are welded to the inside of the side posts. Light spacer channels are applied between posts in these areas.

The ends of the cars are stainless-steel sheets in sec-

tions, each with a vertical flange at one edge which serves as a stiffener. These sections are welded together.

The collision posts are built-up sections of heavy-gauge stainless steel. These are plug welded to stubs which extend up from and are welded to the cast-steel end sill at the bottom. The tops of the posts are fastened securely into the roof structure. There are reinforced lifting holes in the tops of the posts on all cars.

The roof is built up of Z-section carlines and longitudinally corrugated roof sheets, welded together and reinforced in the area over all door openings with flat plates which are welded to the carlines and corrugations. Two exterior purlines of flanged channel section extend the length of the car. These are reinforced for 6 ft. at each end of the car by plates welded to the flanges of the channels. A continuous channel encloses the ends of the carlines on each side at side frame attachment.

The connection between the roof and side of the car is made by two flat plates of stainless steel which reach from end to end of the car. That on the outside is the letterboard which extends well up over the outside of the carlines and under the lower section of corrugated roof sheet and down the side posts to the top rail just over the windows. The inside sheet is welded to the roof side plate and carlines and to the inside of the side posts.

The sides of the cars are finished with shallow vertical skirts below the side sills. At the ends the skirts are downward to join the deeper inward-curving skirt under the step well of the vestibule. Hinged openings are provided where needed for access to under-body equipment.

The rear end of the rear sleeping car—the last car in the train—is built with rounded corners and no diaphragm connection. The side sheathing is continued

around the corner of the end to give a finished appearance. A Mars back-up and emergency light is built in the rear end of the roof. Rear-end fixed marker lights are built into the letterboard area.

The interior finish of walls and ceiling is aluminum sheets, attached with blind rivets or self-tapping screws.

In general, partitions are of plywood, faced on both sides with either aluminum or stainless steel. On sleepers bonderized zinc-coated carbon steel is used.

In kitchen and pantry areas the partitions are metal supported on square steel tubing. The sheathing on passageway side is aluminum; on the kitchen and pantry side, stainless steel, except behind the kitchen equipment.

The floors in the passenger space are water-resisting plywood, attached directly to the transverse supports of the sub-floor structure by blind rivets, but separated from them by sound-insulating tape.

In all chair cars, the dormitory, the coffee-shop-lounge cars, the kitchen passageway and steward's area of the diners, and the lounge car, except the passenger area, the floors are covered with rubber applied over the plywood. Carpet is laid over rubber padding which is applied on the plywood in the main dining room of the diner, the main passenger area of the lounge car, and in the passageways, bedrooms, and roomettes of the sleeping cars. In the kitchen, pantry and bar areas the floors are stainless steel, with wood racks above. In the baggage and railway post office area, except the fish racks, the floor is $1\frac{3}{16}$ -in. tongue-and-groove Douglas fir, surfaced with Worthwood end-grain block flooring with asphalt paper between. The under course is laid longitudinally and attached directly to the flanges of the sub-floor pans with self-tapping screws. The fish-rack area is covered with a water-tight stainless-steel pan and removable wood racks in place of the wood-block surface.

The car bodies are insulated with Ultralite, 3-in. thick in the roof, sides, ends and floor. A coat of Insulmat is applied to the inside of the floor pans before the insulation is laid. Acobyte Bond sound-deadening material is sprayed on inside surfaces of side walls, ends and roofs.

Window sash in the passenger-carrying cars are Adams & Westlake double-glazed breather type, except in the kitchen and pantry areas and in the baggage-postal car. The outside pane is heat-absorbing polished plate glass and the inside, laminated safety glass. Both are $\frac{1}{4}$ in. thick. Double-glazed breather sash are also applied in the postal section of the baggage-postal. Body end doors of all passenger-carrying cars are single-section plywood, sheathed on the exterior with stainless steel, and on the interior with Galvannealed steel. All have National Pneumatic automatic door operators, except at rear of rear sleeper and in baggage-dormitory and baggage-postal cars.

Mechanical and Electrical Equipment

The electrical system on the baggage-postal cars is 32-volt d.c. Power is furnished by a Safety 5-kw. generator with flat-belt drive. On all the other cars power is generated by a General Electric 25-35-kw. axle-driven motor generator. The motor for standby operation is 25-hp., three-phase, 60-cycle, 220-volt, a.c. The drive is the Spicer Model 6-1 with automatic clutch. Power is used at 110 volts d.c. and at 110 and 220 volts a.c. An amplidyne booster inverter provides 5 kw. of 60-cycle, three-phase a.c. power at 220 volts for fluorescent lighting and fans. A bank of three 1-k.v.a. transformers convert 220-volt a.c. to 110 volt for lighting and appliances on all cars except the dormitory. Batteries are Edison type A-16-H. All except those for the baggage-postal cars are 90 cells, 115

volts, 600 amp.-hr. at the 5-hr. rate. The baggage-postal car battery comprises 25 cells, 32 volts, with the same ampere-hour capacity. All batteries are mounted in stainless-steel battery boxes with removable roll-out cradles which permit access to the tops of the trays without completely removing the batteries from the car.

Lighting in the baggage-postal and baggage-dormitory cars is incandescent. In the coaches the center ceiling lights, the lounge ceiling lights, the parcel-rack lights and the passageway ceiling lights are fluorescent. Fluorescent lights are also used in the cove lighting of the dining room, the main lounge of the lounge car, and the tavern and dining cove and the bar cove of the coffee-shop-lounge car. Toilets, lockers, kitchens and night lights are incandescent. In the coaches, bedrooms and roomettes emergency incandescent lamps are installed with the overhead fluorescent lamps. Six-watt blue night lamps are included in the parcel-rack fixtures. All incandescent lamps, except in the baggage-postal car, are on 110-volt d.c. circuits. The instant-start fluorescent lamps in the ceilings of the bedrooms and roomettes of the sleeping cars use 220 volts. Other fluorescent lamps use 110-volt a.c. current.

Air-conditioning blower and pump motors are supplied with 220-volt. a.c. current. Room fans and air-conditioning compressor motor operate at 110 volts d.c.

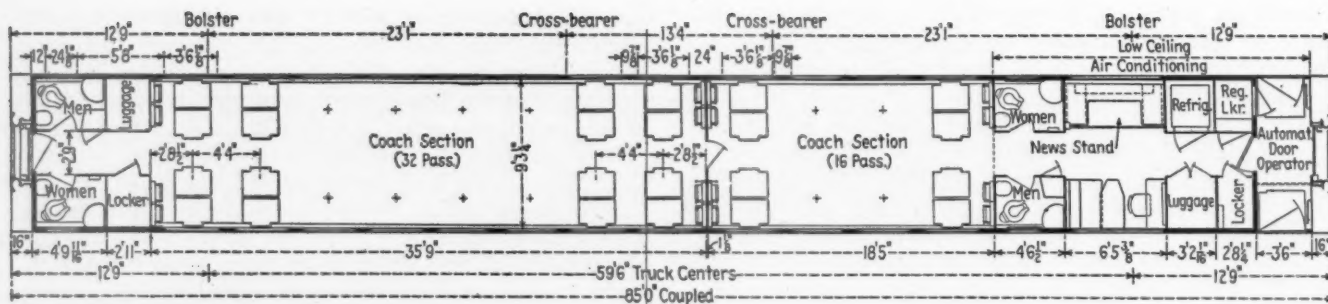
Circuit-breaker protection is provided for power circuits, except for Frigidaire motors which are fused. Solderless terminals are used on all wire and cable. Each car has a two-wire battery trainline cable.

All cars except the baggage-postal cars have the Frigidaire electro-mechanical air-conditioning system. The system includes a full flooded condenser with a capacity of 10 tons and an evaporator divided in two equal sections to permit step modulation. The evaporated blower is rated at 2,400 cu. ft. per min.

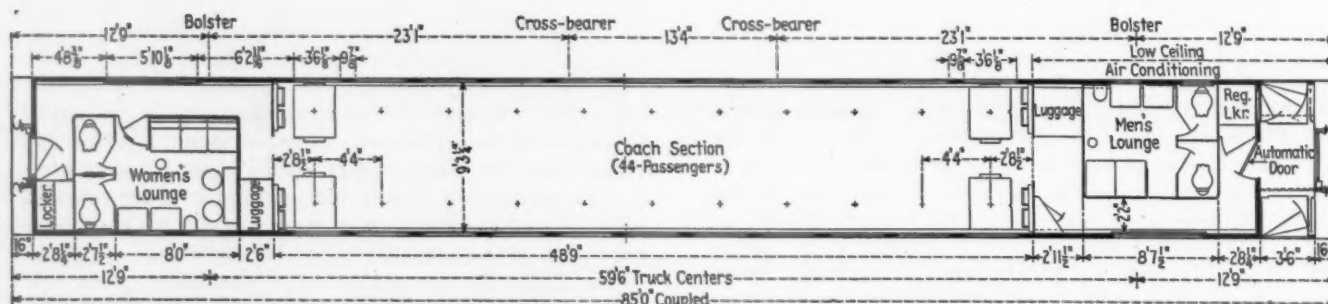
In the coaches air is distributed to the main passenger compartment through a duct over the center of the ceiling, controlled by the railroad's own adjustable-plate distributor. Anemostats are employed in the passageways, rooms of the sleeping cars, and in the small rooms of the lounge car. Multi-Vent air distributors are installed in the dining and lounge areas of the coffee-shop-lounge car, lounge car and the diner. The fresh-air supply amounts to 800 cu. ft. per min. and the recirculated air to 1,600 cu. ft. per min. Both the fresh and recirculated air passes through two Farr filters before entering the plenum chamber of the blower unit, except on sleeping cars where separate fresh-air and recirculated filters are used. The latter are the Detroit Dry Throw-Away type.

The cars are heated by the Vapor zone-control system with an overhead heat from coils built into the air-conditioning evaporator. Floor radiators are copper tubes with aluminum fins. Controls in roomettes and bedrooms in the sleeping cars are a selective automatic thermostat which can be set for temperatures between 67 and 80 deg., a separate remote control for a complete shut-off of the floor heat and damper control of the conditioned air delivered to each room. Central control in each car is the Vapor automatic panel for heat and air conditioning.

All cars except the baggage-postal cars have pressure water systems with two 250-gal. stainless-steel tanks housed under the car and interconnected. In addition, the coffee-shop-lounge car and the diner each have two 75-gal. water tanks over the passageway ceiling piped as a part of the pressure water system. Each sleeping car has a circulating ice-water system. A complete loop of insulated pipe has branches leading to faucets in the bedrooms and roomettes. The cooler is electro-mechanical.



Divided chair car



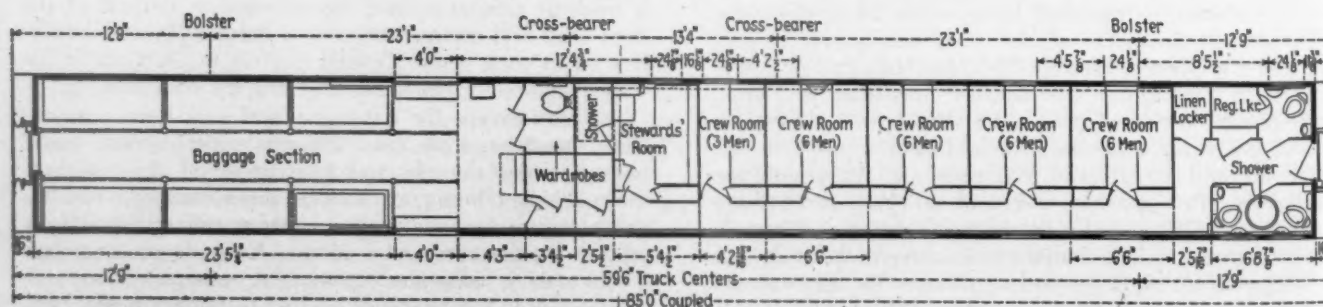
44-passenger chair car



Folding shelves in the baggage cars



A typical chair-car interior—Murals are in full color



Baggage-dormitory car

PARTIAL LIST OF MATERIALS AND EQUIPMENT ON THE BUDD-BUILT "SUNSET LIMITED"

Blind rivets for attaching side panels.....	Cherry Rivet Co., Los Angeles, Cal.
Truck frames and bolsters.....	General Steel Castings Co., Granite City, Ill.
Wheels and axles.....	Standard Steel Works Div. of Baldwin Locomotive Works, Burnham, Pa.
Journal bearings and boxes.....	SKF Industries, Philadelphia, Pa.
Truck springs.....	American Locomotive Co., Railway Steel Spring Div., New York
Locking truck center pin.....	W. H. Miner, Inc., Chicago
Shock absorbers.....	Houdaille-Hershey Corp., Houdaille Engineering Div., Buffalo, N. Y.
Hot journal alarm system.....	Fenwal, Inc., Ashland, Mass.
Draft gear.....	Waugh Equipment Co., New York
Draft-gear yoke; coupler; uncoupling mechanism (one side).....	National Malleable & Steel Castings Co., Cleveland, Ohio
Sound deadening material.....	Fabreeka Products Co., Boston, Mass. Thermoid Co., Trenton, N. J.
Wheel-slide control:	
Four-wheel trucks.....	Budd Co., Philadelphia, Pa.
Six-wheel trucks.....	Westinghouse Air Brake Co., Wilmerding, Pa.
Air brakes, hose and couplers, water-raising equipment, water-system filler valves.....	Westinghouse Air Brake Co., Wilmerding, Pa.
Truck brakes:	
Four-wheel trucks.....	Budd Co., Philadelphia, Pa.
Six-wheel trucks.....	American Steel Foundries, Chicago
Bushings.....	Ex-Cello-O Corp., Detroit, Mich.
Side bearings (six-wheel trucks).....	American Steel Foundries, Chicago
Brake shoes (six-wheel trucks).....	American Brake Shoe Co., New York
Hand brakes.....	National Brake Co., New York
Generator (baggage-postal).....	Safety Car Heating & Lighting Co., New York
Generator transformers, amplifier-booster inverter, wire and cable.....	General Electric Co., Schenectady, N. Y.
Generator drive.....	Spicer Mfg. Div., Dana Corp., Toledo, Ohio
Battery-charging, trainline and standby receptacles; trainline jumpers; electric marker light receptacles.....	Pyle-National Co., Chicago
Battery.....	Edison Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J.
Jumpers, plugs and receptacles.....	Mines Equipment Co., St. Louis, Mo.
Fuse testers.....	Vapor Heating Corp., Chicago
Lamp regulator.....	Safety Car Heating & Lighting Co., New York
Annunciators.....	Edwards & Co., Norwalk, Conn.
Radio and public address.....	RCA Victor Div., Trenton, N. J.
Light fixtures.....	Luminator, Inc., Chicago
Air conditioning.....	Safety Car Heating & Lighting Co., New York
Steam trainline insulation.....	Johns-Manville, New York
Heating system and control panels; steam and valves, connectors and couplers.....	Vapor Heating Corp., Chicago
Air filters.....	Farr Co., Los Angeles, Calif.
Exhaust fan; fans (steward's room).....	Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Boston, Mass.
Air distributors.....	Anemostat Corp. of America, New York Budd Company, Philadelphia, Pa. Pyle-National Co., Chicago
Recirculated air grills; door grills.....	Barber-Colman Co., Rockford, Ill.
Pans (baggage-postal).....	Safety Car Heating & Lighting Co., New York
Vestibule enclosures; vestibule curtains.....	Adams & Westlake Co., Elkhart, Ind.
Outer vestibule diaphragm; vestibule flooring.....	United States Rubber Co., New York
Passenger-step mechanism.....	O. M. Edwards Co., Syracuse, N. Y.
Window sash; window-shade mechanism.....	Adams & Westlake Co., Elkhart, Ind.

Window glass:	
Inside.....	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Outside.....	Libbey-Owens-Ford Glass Co., Toledo, Ohio
Kitchens.....	Mississippi Glass Co., New York
Window shades.....	Collins & Aikman Corp., New York Goodall Fabrics, Inc., New York Pantasote Co., New York
Venetian blinds.....	Ajax Consolidated Co., Chicago
Car-body insulation.....	Gustin-Bacon Manufacturing Co., Kansas City, Mo.
Sound deadening in floor, roof, sides and ends.....	J. W. Mortell Co., Kankakee, Ill.
Waterproof adhesive.....	Acorn Refining Co., Cleveland, Ohio
Carpet.....	Mohawk Carpet Mills, Amsterdam, N. Y.
Under carpet pad.....	United States Rubber Co., New York
Rubber flooring.....	Goodyear Tire & Rubber Co., Akron, Ohio
Flooring, baggage and postal areas.....	Worth Lumber Co., Seattle, Wash.
Foam rubber for seats.....	Goodyear Tire & Rubber Co., Akron, Ohio
Coach seats; bulkhead foot rest.....	Dunlop Rubber Co., Akron, Ohio
Seat coverings:	
Fabric.....	Heywood-Wakefield Co., Gardner, Mass.
Leather.....	Collins & Aikman Corp., New York
Draperies.....	Goodall Fabrics, Inc., New York
Conductor's revolving seat; vanity stools; dining-room chairs; settee; lounge chair; desk chair.....	Ashtabula Hide & Leather Co., Ashtabula, Ohio
Decorative mirrors and etched plate-glass partitions.....	Goodall Fabrics, New York
Murals.....	General Fireproofing Co., Youngstown, Ohio
Mattresses.....	Cadillac Glass Co., Detroit, Mich.
Kitchen and pantry equipment; steam cooker; Tri-ulator; steam table.....	Kaufman & Fabry, Chicago
Range.....	Goodyear Tire & Rubber Co., Akron, Ohio
Propane cabinets.....	Angelo Colonna, Philadelphia, Pa.
Insulation back of range.....	Stearns Co., Chicago
Bars, buffets, refrigerators not in kitchen and pantries.....	Waukesha Motor Co., Waukesha, Wis.
Refrigerating equipment—kitchen pantries and bars.....	Johns-Manville, New York
Water heater.....	Walrus Manufacturing Co., Decatur, Ill.
Water heater (kitchen).....	Carbofreezer Co., San Francisco, Cal.
Water-pipe insulation.....	Vapor Heating Corp., Chicago
Blind rivets (piping, brackets, etc.).....	Hotstream Heater Co., Cleveland, Ohio
Water coolers (chair cars).....	Union Asbestos & Rubber Co., Cicero, Ill.
Water cooler (R.P.O.).....	Clark Equipment Co., Buchanan, Mich.
Water cooler (baggage area).....	Westinghouse Electric Corp., Pittsburgh, Pa.
Cup dispensers.....	E. A. Lundy Co., New York
Lavatories; dental bowls; hoppers, sleepers; shower head and curtain rod.....	Henry Giesel Co., Chicago
Shower controls.....	Dixie Cup Co., Easton, Pa.
Hoppers.....	United States Envelope Co., Paper Cup Div., Worcester, Mass.
Folding washbasin—crew's and baggage rooms.....	Crane Co., Chicago
Paper-towel dispenser.....	Kohler Co., Kohler, Wis.
Automatic door openers.....	Duner Co., Chicago
Locks, cylinder type; interior door closers.....	Adams & Westlake Co., Elkhart, Ind.
Locks, end door.....	Scott Paper Co., Chester, Pa.
Door open holder, body and door.....	National Pneumatic Co., Rahway, N. J.
Paint:	
Exterior.....	Yale & Towne Mfg. Co., Stamford, Conn.
Interior.....	Dayton Manufacturing Co., Dayton, Ohio
Aluminum primer.....	H. S. Getty & Co., Philadelphia, Pa.
Fire extinguishers.....	Dolphin Paint & Varnish Co., Toledo, Ohio
Back-up and emergency light.....	Sherwin-Williams Co., Cleveland, Ohio
	Sherwin-Williams Co., Cleveland, Ohio
	C-O-Two Fire Equipment Co., Newark, N. J.
	Pyrene Manufacturing Co., Newark, N. J.
	Mars Signal Light Co., Chicago

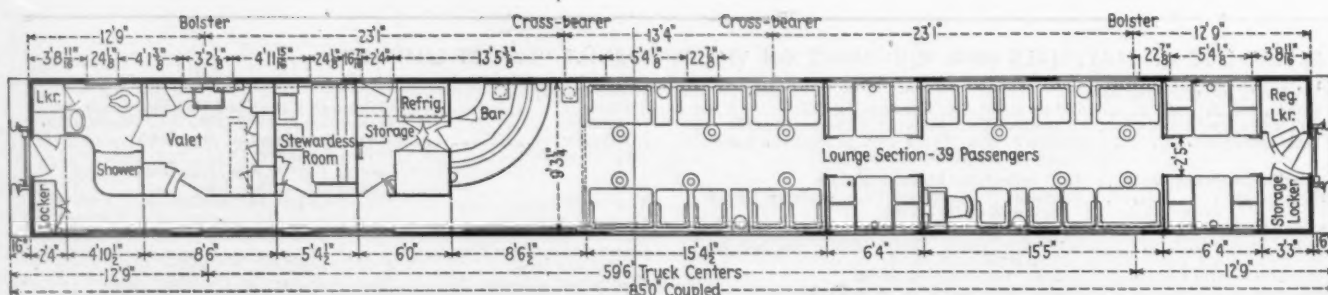
In the chair and chair-news cars Westinghouse electric coolers with paper-cup dispensers are installed, one in each chair car and two in each chair-news car. One Giesel ice cooler is placed in each baggage section of the baggage-postal and the baggage-dormitory cars and in the diner and coffee-shop-lounge cars. The postal area has a Lundy combined electrochemical water cooler, food refrigerator and steam cooker unit.

The "French Quarter" Lounge and "Pride of Texas" coffee-shop-lounge cars are each equipped with an R.C.A. radio and public address system, including antenna, radio receiving sets and public-address microphones and amplifiers. The radio receivers are adapted both for AM and FM tuning. There are four speakers in the lounge car and three in the coffee-shop-lounge car. There are five speakers in each chair car and three in each diner. The sleeping cars are not equipped with speakers.

All cars except the baggage-postal cars have General

Steel Castings four-wheel trucks with 8-ft. 6-in. wheel base. Wheels are multiple-wear wrought-steel, 36 in. in diameter. Axles are 6 in. by 11 in. and are fitted with SKF roller bearings and boxes. The springs are helical coil throughout and Houdaille shock absorbers are applied on the bolster and outboard end transom. Side bearings are the Budd friction type, and Budd disc brakes with Rolokron anti-wheel-slide device are installed throughout. Fabreeka sound insulating pads are applied at the bottom of equalizer coil-spring seats and between swing hangers and spring plank. A 1¼-in. Thermoid insulating pad is inserted between the body and truck center plates.

The baggage-postal cars have six-wheel trucks with 11-ft. 6-in. wheel base. These differ from the four-wheel trucks in a number of respects. Leaf springs are used under the bolsters, side bearings are Dreads Evertite, and the truck brakes are the unit cylinder clasp type with Westinghouse AP decelostat and speed-governor control.



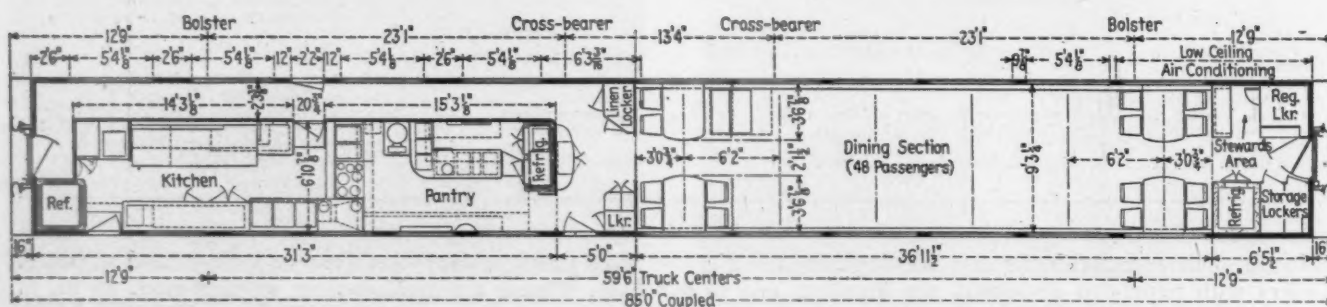
The "French Quarter" lounge



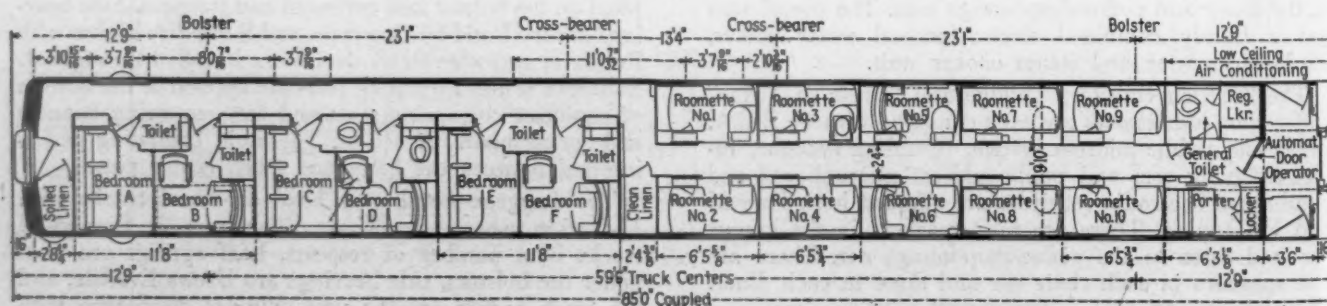
Interior of the "French Quarter" lounge



The dining cars are decorated with Audubon bird groups, hand painted in colors



The dining car



Rear sleeping car

All of the trucks have derailment safety guides fitted in the pedestal openings under all journal boxes. All journal boxes have hot-box odor bombs and thermal elements of the Fenwal hot-box alarm system.

The air brakes are Westinghouse HSC system with electropneumatic straight air control arranged for 100 lb. per sq. in. cylinder pressure. National lever-type hand brakes are placed at each end of each car and arranged to act on all wheels on one side of each truck. Couplers are National Malleable tight lock with uncoupling mechanism operating from one side only. Draft gears are Waughmat WM-6DP.

The Feature Cars

The feature cars of the train are the two lounge cars and the dining car. In the "French Quarter" lounge, styled to reflect the gaiety of old New Orleans, watermelon red is the predominant note. The "Pride of Texas" coffee-shop lounge employs combinations of tan, brown and sunflower yellow, with extensive decorations of leather, marked with authentic brands of many ranches, and repousses of long-horn steer heads and Mexican spurs. Soft tones of jade and turquoise are the predominant colors in the diner, contrasting with which is a bone-white frieze and end panels, on which are hand painted bird groups in the Audubon manner.

An attendant in the "French Quarter" lounge is available for valet service. There is also a shower for the use of sleeping-car passengers.

Refrigerators in the kitchens and pantries of the diner and the coffee-shop lounge car and at the bars of both lounge cars are cooled by dry ice. The system employed was developed by engineers of the railroad and the Carbofrezer Company, San Francisco, Calif.

The Chair Cars and Sleepers

The Sleepy Hollow seats in the chair cars are spaced 52 in. between centers. Each chair has an adjustable back and a leg rest which can be placed out of sight underneath. Each chair has a foot rest and individual ash tray. A light in the baggage rack is located over each double seat.

Four-color photographic murals are mounted on the bulkheads at the ends of the passenger compartments.

Three color schemes are employed in the decorations of these cars. One is brown and tan, with turquoise upholstery; the second is rose and light pink, with upholstery in two tones of blue; the third is rose in two tones, with two tones of beige upholstery.

One chair car on each of the five trains is divided into three sections. Two of these seat 32 and 16 passengers, respectively, and the third contains a newsstand and office for the conductor. The newsstand can be closed at night by a stainless-steel gate.

Each of the six sleepers in each train has six double bedrooms and 10 roomettes. The bedrooms are alternately of longitudinal and transverse type, arranged to be thrown together in pairs to make a drawing room which accommodates four persons. Both types have enclosed toilets and wardrobe lockers.

Three color combinations are employed in these cars: tan and light taupe beige, parchment and bright navy; sand white and a delicate green. The two colors in each scheme are reversed in alternate roomettes. With the first two schemes, upholstery alternates between wood tone and ashes of roses; in the third, between wood tone and cedar.

The Head-End Cars

The baggage-dormitory car can accommodate 27 members of the train's crew in five rooms that have bunks similar to those found on navy ships. Each room has an individual wash basin. Wardrobes are available for crewmen and there is a shower. An individual room for the steward has upper and lower berths.

The baggage-postal car has a 30-ft. railway post office and a 52-ft. baggage room. Along the sides of the baggage room at one end are eight shelves 30 in. wide by 8 ft. long, arranged two deep. These are hinged to the wall and suspended by chains at the ends so that they may be turned up against the side of the car.

The exterior of each train is of unpainted stainless steel, with a letterboard band of Daylight red running the entire length of the train. Centered beneath the windows of every car is a colorful name plate bearing the name of the train in orange and the number of the car in Daylight red.



Union Pacific Gets New Freight Cars



Application of one of the box car side doors

A CAR-BUILDING program now in full swing on the Union Pacific will add 4,500 cars to the railroad's fleet of freight forwarders. To this total can be added 2,000 gondola cars which the railroad will purchase from the General American Transportation Corporation and 1,000 fifty-ton box cars from the American Car and Foundry Company.

Out of the 7,500-car total, 2,500 box cars will be completed in October and the remainder will be ready for service early next year. The new car-building program with equipment purchases will cost approximately



Use of paint spray gun in stenciling one of the new cars

\$43,800,000 and required the hiring of 725 additional men at the railroad's shops at Omaha and Grand Island, Neb., and Denver, Colo., where the assembly lines are in action.

At Omaha 2,500 fifty-ton box cars are being built with another 1,000 of the same type being constructed at Grand Island. Five hundred double-deck stock cars and 500 flat cars are under construction at Denver.

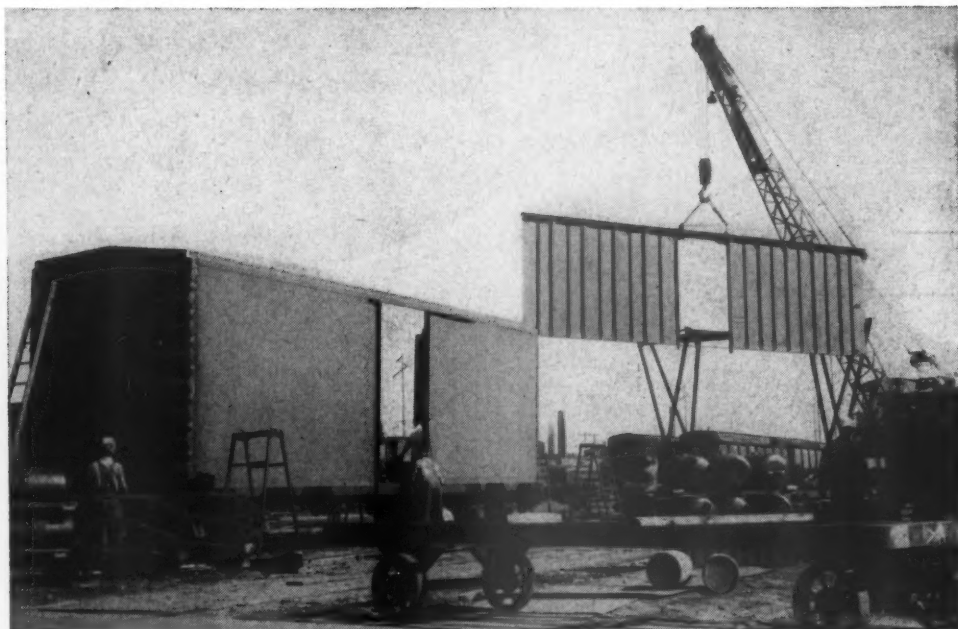
This is the first car-building program undertaken by the railroad in ten years. The decision to make use of the railroad facilities in the construction was motivated partially by the desire to "assist the economy of the territory which the railroad serves," according to A. E. Stoddard, President of Union Pacific.

When the component parts are finally assembled, actual construction of the box cars follows the procedure shown in the illustrations.



Initial step in assembling one of the new U.P. box cars

How a car side is applied to the underframe



At the head of the assembly line, underframes are placed in the jig in the foreground of one of the views where draft gear, brake cylinder, air reservoir and valves are attached. As shown, this assembly is then hoisted onto trucks previously put together in the shop from necessary components, such as sideframes, bolsters, wheels, axles and springs. The unit is then rolled forward to the next working position.

Ends and sides of the 50-ton box cars, previously assembled, are hoisted into position to be held by temporary fit-up bolts as work progresses. A coating of car cement is applied at points where sides and ends contact the underframe to make the cars weatherproof and prevent corrosion.

As the cars move forward to the next working station, doors are swung into position and couplers added with the help of a gantry crane. From here on the cars are coupled together for movement through the remaining stages of construction.

Roof sheets are put on inside the shops and seam caps placed over the joints. Rivets through the seam caps

are cold squeezed in place using two hydraulic riveters newly installed to speed this stage of the work. Hot rivets are used to hold the roof sheets to the cars. From here on the hand brake assembly joins the rapidly-finishing cars and metal running boards are put in position on top.

Having passed through the shops, the cars are sprayed on the inside of the roof with insulating material. This asphaltic compound contains ground cork and serves to prevent moisture condensation, maintain even temperatures and deaden sound inside the cars. New steel additions on the exterior are given a coat of primer and the cars double back to the shops for their interior wood work.

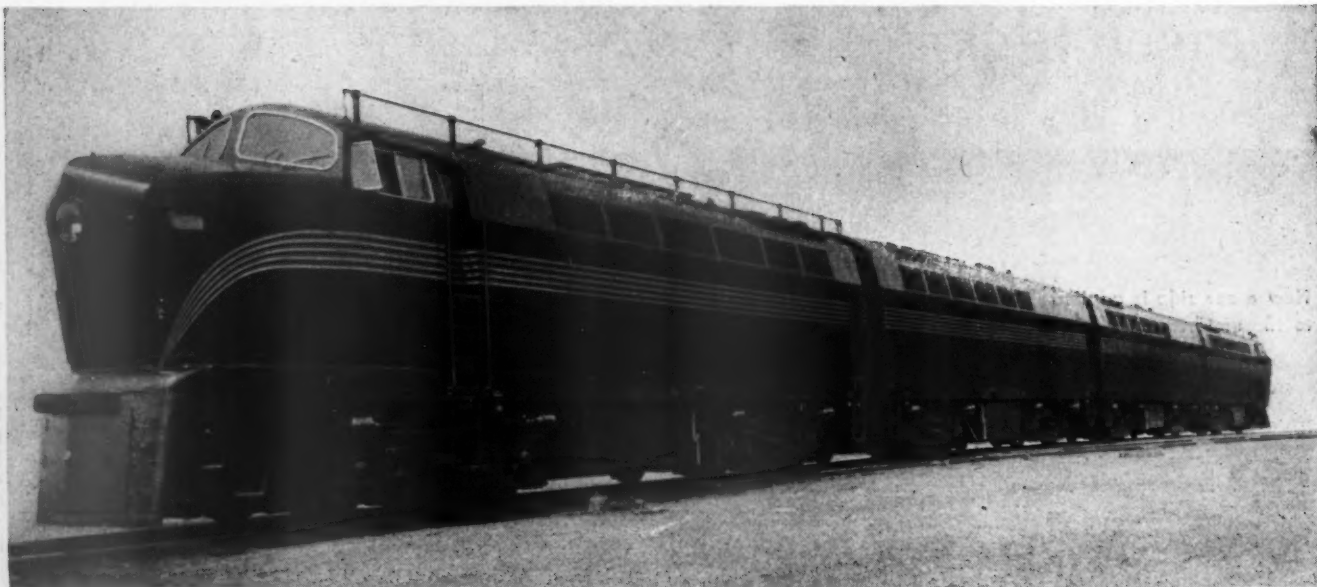
Plank flooring is laid and bolted down and the wood siding is nailed in place as shown in one of the interior views. After the final inspection the cars go into the paint shop for two coats of red freight car enamel. The outside ends and the underframes get a coating of black car cement and the cars are then rolled outside for stenciling. At one of the assembly lines 20 cars a day are being built and placed in service.



The smooth floor and inside lining appeal to shippers



Assembly and application of the riveted steel roof

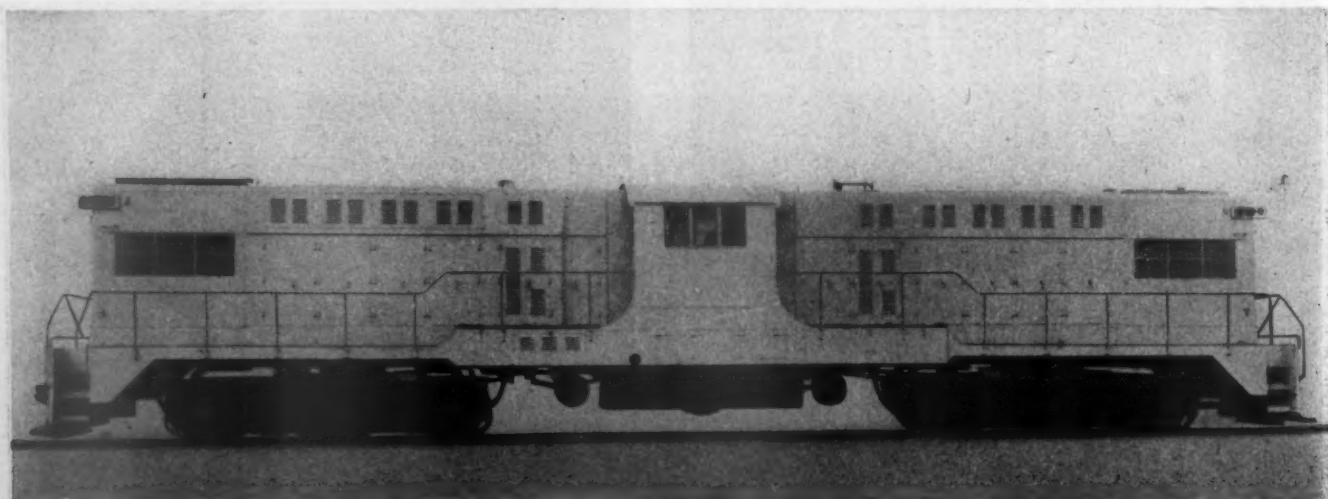


A 6,400-hp. road freight locomotive made up of two A and two B model RF-16 units

Baldwin-Westinghouse Standard Diesel-Electric Locomotives

THE Baldwin Locomotive Works has developed a line of Baldwin-Westinghouse locomotives the units of which have increased flexibility and improved hauling capacity. These improvements, together with the changes which provide greater availability through improved access for maintenance, constitute the first major revision of all models of this builder since the end of the war.

This major revision includes increased horsepower for traction and increased tractive force ratings at continuous rating speeds. It also covers the modifications of the individual locomotives to include new engineering developments directed principally toward increased dependability, simplicity and ease of maintenance. The primary feature of this major revision is the high degree



The 2,400-hp. road transfer locomotive with two 1,200-hp. power plants, six-wheel trucks, and six traction motors

THE BALDWIN-WESTINGHOUSE STANDARD LINE OF DIESEL-ELECTRIC LOCOMOTIVES



TYPE Horsepower Model	ROAD FREIGHT 1600 h.p. (A or B unit) RF-16		ALL SERVICE 1600 h.p. AS-16 AS-416 AS-616			TRANSFER 2400 h.p. RT-624	SWITCHERS 1200 h.p. RS-12 S-12		800 h.p. S-8
PERFORMANCE:									
Tractive force (30 percent adh.)	73,800 lb.	70,800 lb.	52,200 lb.	97,500 lb.	106,200 lb.	67,200 lb.	72,000 lb.	59,550 lb.	
Tractive force (25 percent adh.)	61,500 lb.	59,000 lb.	43,500 lb.	81,250 lb.	88,500 lb.	56,000 lb.	60,000 lb.	49,625 lb.	
Continuous tractive	52,500 lb.	52,500 lb.	52,500 lb.	78,750 lb.	78,750 lb.	32,400 lb.	34,000 lb.	34,000 lb.	
Continuous speed	9.2 m.p.h.	9.2 m.p.h.	9.2 m.p.h.	6.0 m.p.h.	9.2 m.p.h.	11.4 m.p.h.	10.8 m.p.h.	6.8 m.p.h.	
Maximum speed	65 m.p.h.	65 m.p.h.	65 m.p.h.	60 m.p.h.	60 m.p.h.	60 m.p.h.	60 m.p.h.	60 m.p.h.	
Gear ratio	15:68	15:68	15:68	15:68	15:68	14:68	14:68	14:68	
Optional gear ratios	15:63 — 17:62 — 19:60	15:63 — 17:62	15:63	15:63	15:63	
Min. rad. curve (with train)	273 ft. (21 deg.)	191 ft. (30 deg.)	260 ft. (22 deg.)	260 ft. (22 deg.)	260 ft. (22 deg.)	191 ft. (30 deg.)	130 ft. (44 deg.)	130 ft. (44 deg.)	
AVEN. WEIGHTS —	A unit B unit								
Std. UNITS:	lb. lb.								
Loaded	248,000 244,000	236,000 lb.	252,000 lb.	325,000 lb.	354,000 lb.	224,000 lb.	240,000 lb.	198,500 lb.	
On drivers	248,000 244,000	236,000 lb.	174,000 lb.	325,000 lb.	354,000 lb.	224,000 lb.	240,000 lb.	198,500 lb.	
Per axle	62,000 61,000	59,000 lb.	43,500 lb.	54,167 lb.	59,000 lb.	56,000 lb.	60,000 lb.	49,625 lb.	
Light	234,100 229,500	222,800 lb.	238,800 lb.	304,700 lb.	332,500 lb.	211,400 lb.	229,200 lb.	187,700 lb.	
DIMENSIONS:									
Width	10 ft. 6 in.	10 ft. 0 in.	10 ft. 0 in.	10 ft. 2 in.	10 ft. 2 in.	10 ft. 0 in.	10 ft. 0 in.	10 ft. 0 in.	
Height	15 ft. 0 in.	14 ft. 0 in.	14 ft. 0 in.	14 ft. 1 in.	15 ft. 4 1/4 in.	14 ft. 0 in.	14 ft. 0 in.	14 ft. 0 in.	
Length (inside knuckles)	(A) 54 ft. 8 in. (B) 53 ft. 2 in.	58 ft. 0 in.	58 ft. 0 in.	58 ft. 0 in.	74 ft. 0 in.	58 ft. 0 in.	46 ft. 0 in.	46 ft. 0 in.	
Truck wheel base	9 ft. 10 in.	9 ft. 10 in.	11 ft. 6 in.	13 ft. 0 in.	13 ft. 0 in.	9 ft. 10 in.	8 ft. 0 in.	8 ft. 0 in.	
Total wheel base	38 ft. 0 in.	42 ft. 1 in.	43 ft. 9 in.	44 ft. 6 in.	54 ft. 9 in.	42 ft. 1 in.	30 ft. 8 in.	30 ft. 8 in.	
Wheel diameter	42 in.	42 in.	42 in.	42 in.	42 in.	42 in.	40 in.	40 in.	
SUPPLIES:									
Lube oil	200 gal.	200 gal.	200 gal.	340 gal.	340 gal.	170 gal.	170 gal.	165 gal.	
Fuel oil	1,200 gal.	900 gal.	900 gal.	1,900 gal.	1,500 gal.	900 gal.	650 gal.	650 gal.	
Engine cooling water	(A) 300 gal. (B) 370 gal.	300 gal.	300 gal.	300 gal.	500 gal.	250 gal.	250 gal.	250 gal.	
Sand	16 cu. ft.	30 cu. ft.	30 cu. ft.	30 cu. ft.	45 cu. ft.	30 cu. ft.	30 cu. ft.	30 cu. ft.	
CAB AND RUNNING									
GEAR:									
Truck type (swivel)	Swing bolster	Swing bolster	Swing bolster	Rigid bolster	Rigid bolster	Swing bolster	Rigid bolster	Rigid bolster	
Journal bearings	Roller, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	Friction, 6 1/2 in. x 12 in.	
Foundation brake	Clasp, each wheel	Clasp, each wheel	Clasp, end wheels	Single shoe, ea. wh.	Single shoe, ea. wh.	Clasp, each wheel	Clasp, each wheel	Clasp, each wheel	
DIESEL ENGINES (625 r.p.m. at Full Load)	1 8-cyl., superch.	1 8-cyl., superch.	1 8-cyl., superch.	1 8-cyl., superch.	2 6-cyl., superch.	1 6-cyl., cup-erch.	1 6-cyl., superch.	1 6-cyl., n.a.	
ELECTRICAL EQUIPMENTS									
Motors (Westinghouse)	4 Type 370	4 Type 370	4 Type 370	6 Type 370	6 Type 370	4 Type 362	4 Type 362	4 Type 362	
Generators (Westinghouse)	1 Type 471	1 Type 471	1 Type 471	1 Type 471	2 Type 480	1 Type 480	1 Type 480	1 Type 480	
AUXILIARIES (standard):									
Radiator fans	2 Motor-driven	2 Motor-driven	2 Motor-driven	2 Motor-driven	4 Motor-driven	1 Belt-driven	1 Belt-driven	1 Belt-driven	
Traction-motor blowers	2 Belt-driven	2 Belt-driven	2 Belt-driven	2 Belt-driven	2 Belt-driven	2 Belt-driven	2 Belt-driven	2 Belt-driven	
Compressor	3-cyl., 2-stage	3-cyl., 2-stage	3-cyl., 2-stage	3-cyl., 2-stage	2 3-cyl., 2-stage	3-cyl., 2-stage	3-cyl., 2-stage	3-cyl., 2-stage	
BRAKES:									
Air	24-RL	6-SL	6-SL	6-SL	6-SL	6-SL	6-SL	6-SL	
Dynamic	Modification	Modification	Modification	Modification	Modification	Modification	Not available	Not available	
TRAIN HEATING EQUIPMENT	Modification on B units on special request	Modification	Modification	Modification	Not available	Modification	Not available	Not available	

of interchangeability between the new and existing models of locomotives, permitting owners of the latter to take advantage of the improvements.

The Engine

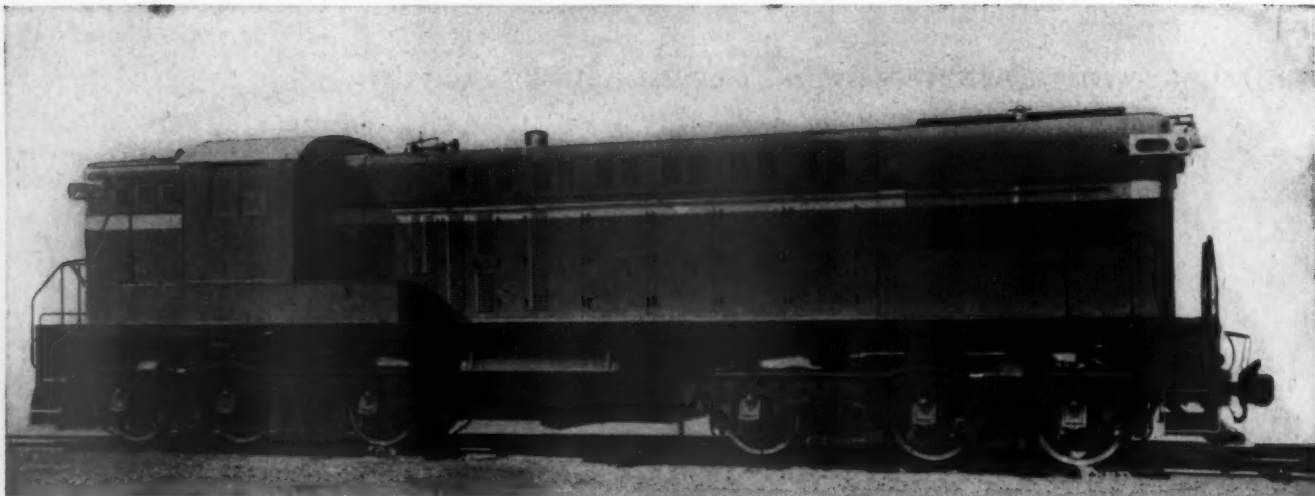
The new line now includes 800- and 1,200-hp. yard switchers; 1,600-hp. "all service" locomotives in four- or six-wheel, four- or six-motor types; a 2,400-hp. road transfer locomotive, and a 1,600-hp. road freight locomotive in A and B units which can be operated in multiple to form 3,200-hp., 4,800-hp., or 6,400-hp. freight locomotives. The tabulation shows the general characteristics of each unit of the new line.

Engine changes made to assure reliability and per-

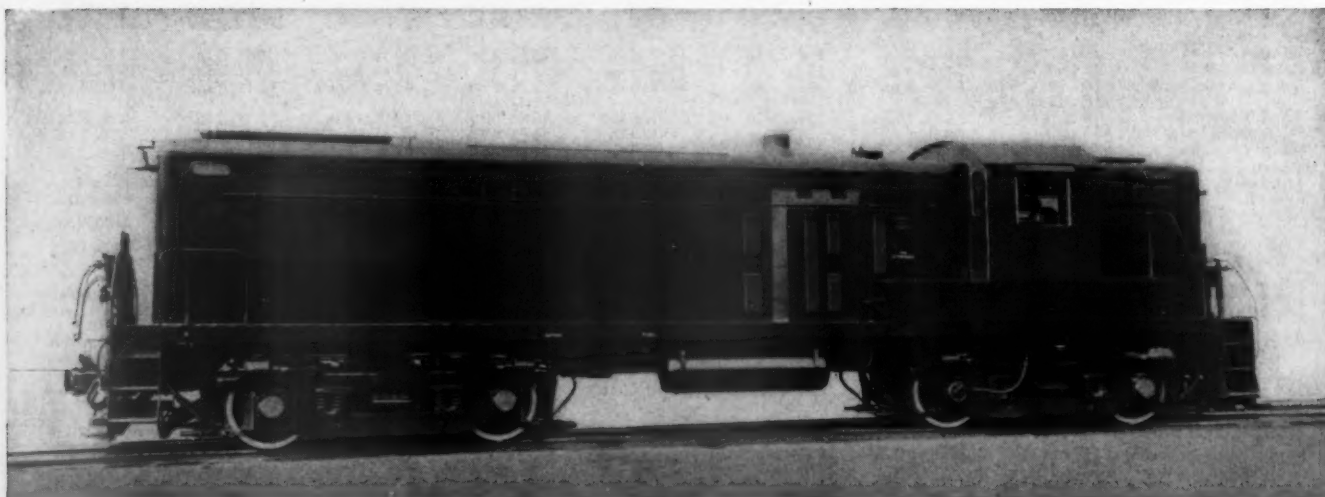
formance at the higher horsepower affect the bedplate, crankshaft and bearings, connecting rods, frame and turbocharger.

The crankshaft has been increased in size at both the main and crankpin journals and has been counterweighted and dynamically balanced to ensure a vibration-free assembly. The web thickness has been increased and rigidity improved by virtue of more overlap between crankpin and main journals. Interchangeability of the old and new shafts has been effected by utilizing thin "strip-process" copper-lead bearings.

The new turbocharger will operate at a higher blower pressure. Capacity has been increased to maintain full engine horsepower output at altitudes up to 8,000 ft.



A 1,600-hp. "all-service" model with six-wheel trucks and six traction motors



One of the 1,600-hp. "all-service" models, with four-wheel trucks

The bedplate stiffness has been increased; stressed members of the main frame are now made of alloy steel. The connecting rods are of increased section and are matched in weight.

The majority of these changes have been in test operations for some time on selected railroads and have proved their merit.

Electrical System

The second major improvement in the Baldwin-Westinghouse locomotives is in the electrical system. Continuous tractive-force ratings have been increased an average of 23 per cent. Maximum motor operating speeds have been increased, while a new gear ratio has been introduced in all models, except switchers, to further improve their capacities and capabilities. These new features increase hauling capacity and, together with the increase in horsepower, allow accelerated operating schedules.

The load regulator has been completely redesigned and incorporates a commutator with fixed resistors, to assure reduced maintenance and little or no adjusting.

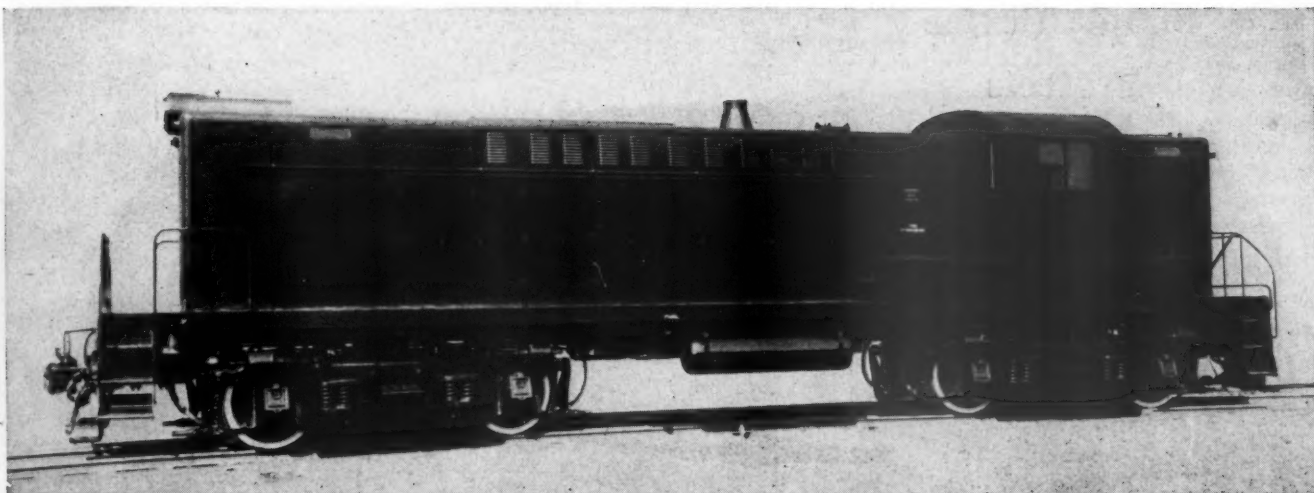
New positive four-step field shunting has been pro-

vided on "all-service" and road-freight locomotives by the addition of only one piece of apparatus. It is actuated by cams and eliminates any possibility of cycling. To the AS-616 locomotive has been added the option of shunting out two traction motors, maintain the horsepower-speed characteristic of a four-motored locomotive but permitting operation with six motors when handling heavy tonnage trains.

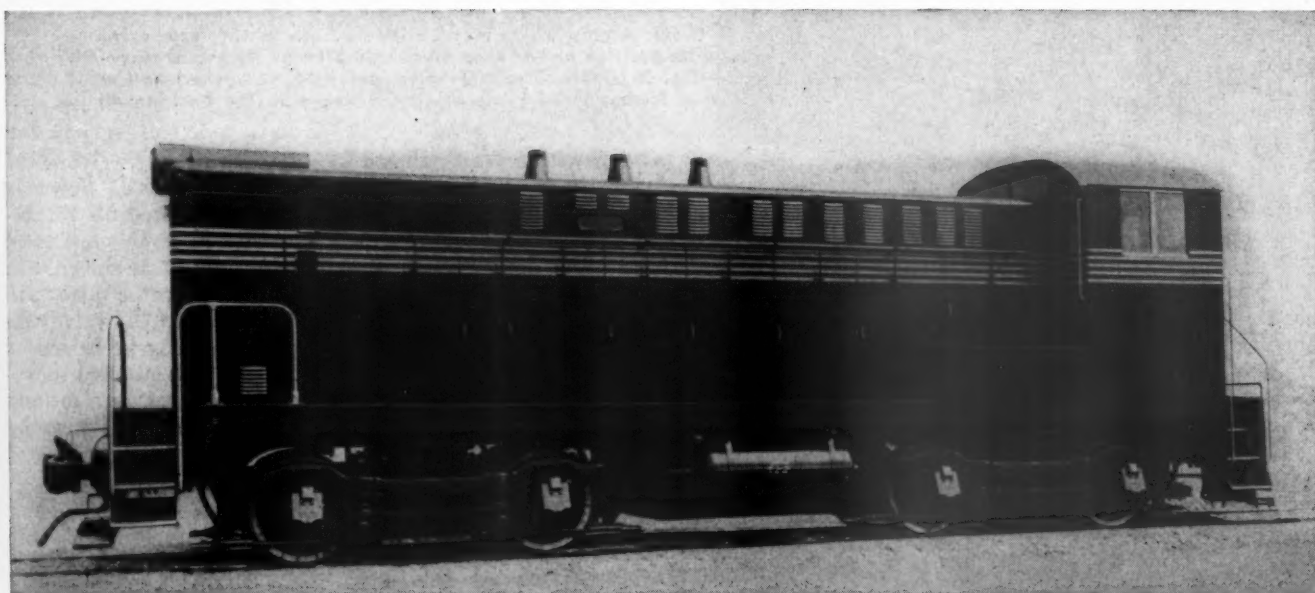
Fuses on the new locomotive models have been eliminated and replaced with circuit breakers.

The pneumatic throttle has been retained. This gives step-free acceleration without the necessity of making manual changes at predetermined speeds or of providing special equipment to effect the speed changes automatically.

Improvements in the locomotive construction have been made with an eye toward increased accessibility for maintenance, increased dependability and improvement in operating conditions for the crew. Among the outstanding improvements in the design of all models of locomotives are new underframe designs utilizing structural shapes and a minimum of plates. Inherent in this design is increased rigidity, strength and the flexi-



The 1,200-hp. road switcher



The 800-hp. yard switching locomotive

bility to vary the weights on units when required for special operations.

Locomotive Construction

Thermostatic control of the radiator fans has been modified by providing a pneumatic step-type controller in place of earlier individual pneumatic switches thus maintaining correct engine operating temperatures in positive sequence.

The cab arrangement of the new road freight locomotive has been modified in keeping with the trend toward neater appearance and improved functional arrangement. Black lighting has been provided for all gages on the road-freight locomotives and the cab nameplates are illuminated. On the switchers, road-transfer and "all-service" locomotives, indirect lighting by the use of Lucite rings has been incorporated.

Retained in the redesign of all models have been the features associated with Baldwin locomotives in the past: maximum fuel and water capacity, weight consistent

with continuous tractive-force ratings, simplified associated auxiliaries and a minimum of electrically driven components.

Consideration has been given to deviations from the basic design to suit special conditions on railroads having special requirements. In the frame design of switcher and "all-service" locomotives, provision has been made to vary the locomotive weight. A modified dynamic brake has been incorporated on all models except the switcher. A desirable feature—maximum air-compressor capacity during periods of dynamic braking—affords the utmost in operational safety. Humping control is offered on all models, permitting locomotive speed regulation suitable for humping, weighing or heavy-grade starting.

Certain features desirable for winter operation have been incorporated as standard while additional features desirable for unusually severe operations can be installed at minimum expense. These features, together with those regularly installed, result in a unit having high adaptability.

Simple Device Protects Standing Diesels

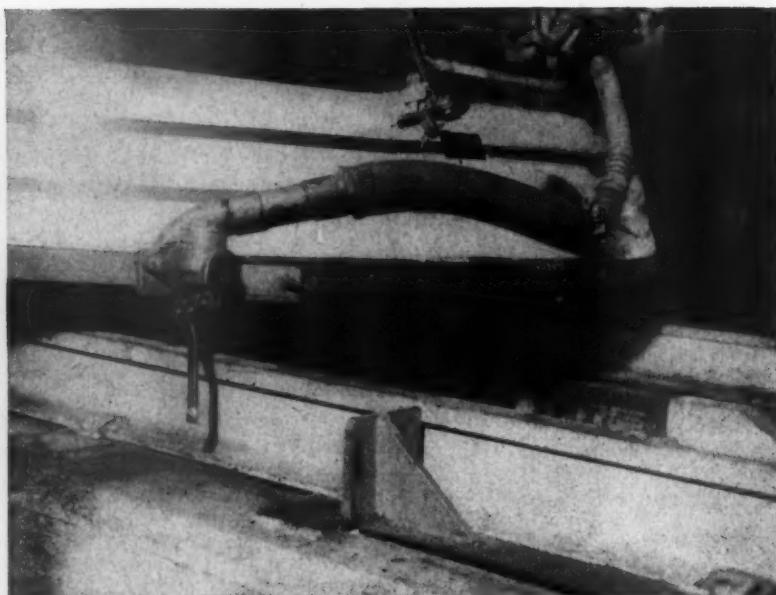


Fig. 1 (left): A stop which may be lowered allows the locomotive to take its position on the shop track and prevent backward movement—Fig. 2 (right): The trip valve and hose as applied to the pilot of a locomotive—A trip or stop is shown in the background

A positive and foolproof device for stopping Diesel electric locomotives which may move or be moved accidentally or maliciously is in service in the Southern Pacific's Diesel shop in Los Angeles, Calif. It consists essentially of a standard air brake hose which is coupled at one end of the locomotive and is fitted at the other

end with a Westinghouse $1\frac{1}{4}$ " conductor's valve, clamped to the lower edge of the locomotive pilot, as shown in Fig. 2. The outlet end of the valve is sawed off to prevent possible plugging and the tripping lever consists of an extended arm which projects downward as shown.

Should the locomotive move forward, the arm will engage the stop shown beside the rail, trip the valve and apply the brakes. A second stop which may be raised or lowered manually (see Fig. 1), prevents backward movement of the locomotive. The trip valve lever is also long enough to reach down between ties so that it may be

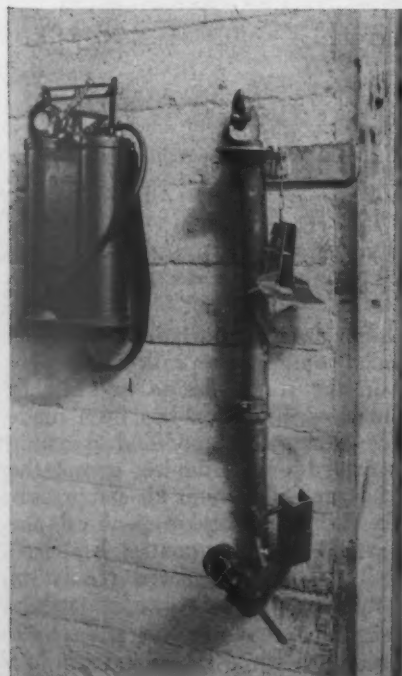


Fig. 3 (left): A protective device consisting of trip valve, hose and angle cock lock hangs beside each track door—Fig. 4 (center): The "Handcuff" and padlock as applied to an angle cock on a locomotive—Fig. 5 (right): One of the warning signs placed in front of each track door

applied when it is necessary for a crew to leave a locomotive at any time outside of the shop area.

The procedure for using the device in the Diesel service shop is as follows. Each entrance door is protected by the warning sign shown in Fig. 5. A locomotive about to enter the shop stops in front of this sign. In case the arrival of the locomotive has not been anticipated, the hostler notifies the shop by means of a conveniently located PBX telephone or through the shop's loud-speaker address system. When the shop is ready to receive the locomotive, a shop man lifts the equipment, shown in Fig. 3, from its position next to the track door and applies it to the locomotive.

There are two devices which are applied to the locomotive. One is the air hose and trip valve which are applied as shown in Fig. 2. The other is a "handcuff" which is locked over the angle cock as shown in Fig. 4. This avoids the possibility of someone closing this valve while the protective equipment is in service. All the padlocks used with the "handcuffs" are locked and unlocked by the same key.

After the device has been applied to the locomotive, the shop man opens the track doors and lowers the sign shown in Fig. 5. This is done by lifting it out of the hole in which it stands, and lowering it to the ties on a hinge connection.

As the locomotive moves onto the shop track, the shop man lowers the stop shown in Fig. 1 by raising the handle to a horizontal position. After the valve trip has passed this point, he again lowers the handle which is heavy enough to hold the stop in a vertical position, and cause a brake application in case of a backward movement of the locomotive.

The device and its method of application were developed by L. P. Oberkamp, assistant master mechanic.

Reclaiming Diesel Motor Bearings

Brass traction motor bearings for Diesel-electric locomotives are economically reclaimed by means of inert-gas shielded arc welding at the shops of an eastern rail-

road. The badly worn flanges are rebuilt with a special wear-resistant bronze rod.

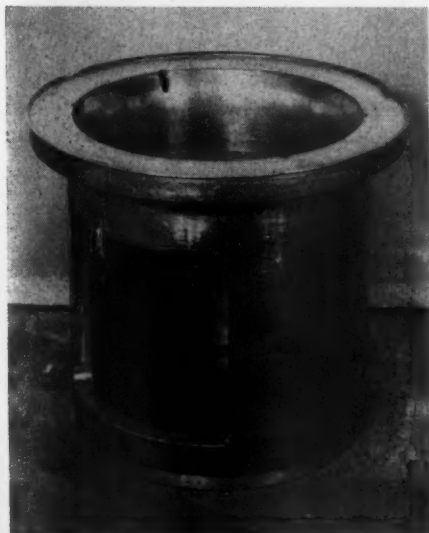
One-half of a bearing is repaired at a time. Since the bearing is lined with babbitt metal, rebuilding is done in a water tank to prevent the babbitt from melting. The babbitt lining, which comes up above the bottom of the flange, is completely submerged in water. A special jig holds the submerged bearing, while the operator uses a Heliarc torch to deposit the bronze rod along the worn flange. The fumes are carried away from the work area by a special air hose arrangement.

Although the bearing is almost completely submerged in water, the flange is easily built up by using a Heliarc welding torch. The high concentration of heat helps the operator deposit the bronze rod quickly and efficiently.

After the flange is built up with bronze, the bearing is machined. Note the chalk marks on the inside of the



One-half a bearing is rebuilt at a time



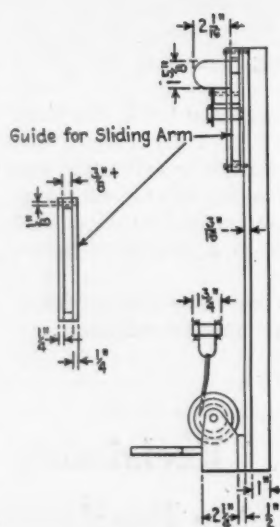
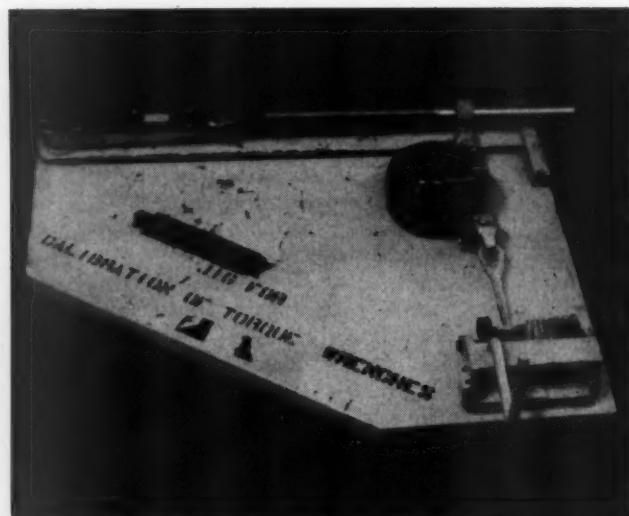
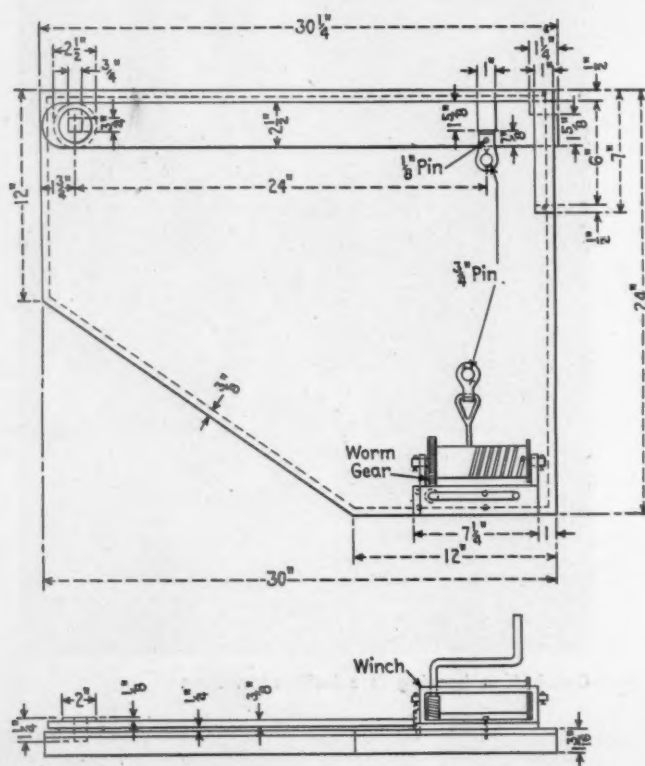
Left: Motor bearing, badly worn on flange, before rebuilding—Center: Bearing after rebuilding—Right: Bearing after machining

bearing. The bottom mark shows how far up the babbit lining comes. The top mark shows the new weld deposit.

The total cost for repairing both halves of a bearing is about \$20. This cost includes labor, materials, and overhead, and is said to save about \$66 on each bearing.

Calibration of Torque Wrenches

A quick and accurate device for checking torque wrenches is being used in the Barstow, Calif., shops of the Santa Fe. The wrench to be calibrated is applied to a rigid square pin, the size of the hole in the head of the wrench and torque is applied to the wrench handle through a Dillion dynamometer by means of a small winch. The



Above: A torque wrench and the dynamometer in place for testing on the calibration jig—
Left: Dimensional drawing of the jig

pull from the winch is applied to the handle of the wrench at a point 24 in. from the center of the wrench head. Since the wrench dial reads in foot-pounds, the reading shown on the dynamometer dial is one-half the reading which should show on the wrench for any amount of torque produced by the winch. In practice, the wrench is checked at several values of torque and its tension spring is adjusted or replaced if the error is more than five per cent.

The testing jig consists of a flanged 3/16-in. steel plate shaped as shown in the diagram. A flat plate or sliding arm, 2 1/2 in. wide and 30 1/4 in. long is free to turn about the wrench head at one end and is held under a guide at the other. The wrench to be tested is applied to the fixed square and the wrench handle is secured to the sliding arm by a clamp at a point 24 in. from the center of the wrench head. The dynamometer is placed between the clamp and the winch cable by means

of removable 3/4-in. pins fitted into loops or rings attached respectively to the clamp and the end of the cable. The capacity of the dynamometer is 1,000 lb.

The jig was developed and made at the shop by W. E. Seagraves, shop foreman.

Keeping Tools Off The Shop Floor

Good housekeeping necessitates keeping all special jigs, fixtures and machine-tool accessories off the shop floor not only in the interest of appearance and helping the sweepers in their work but to avoid damaging this costly

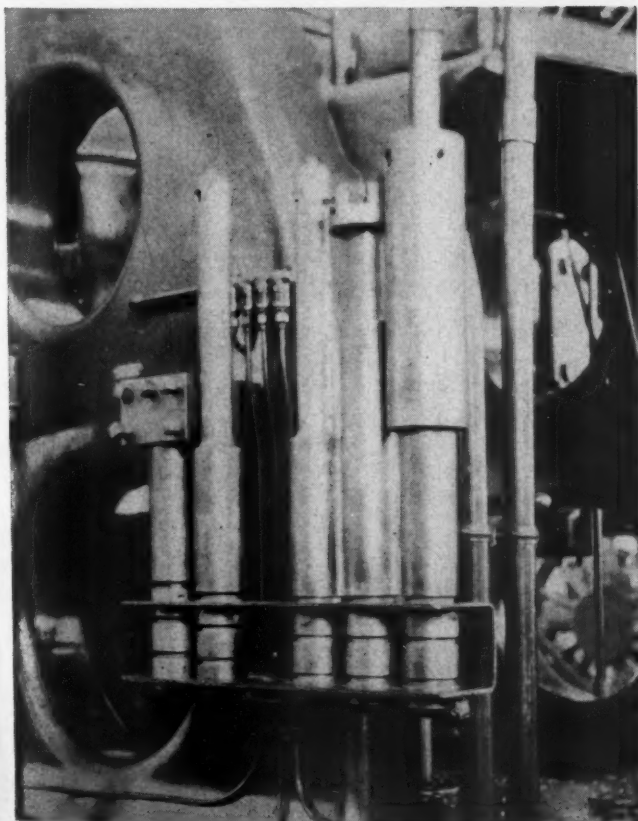
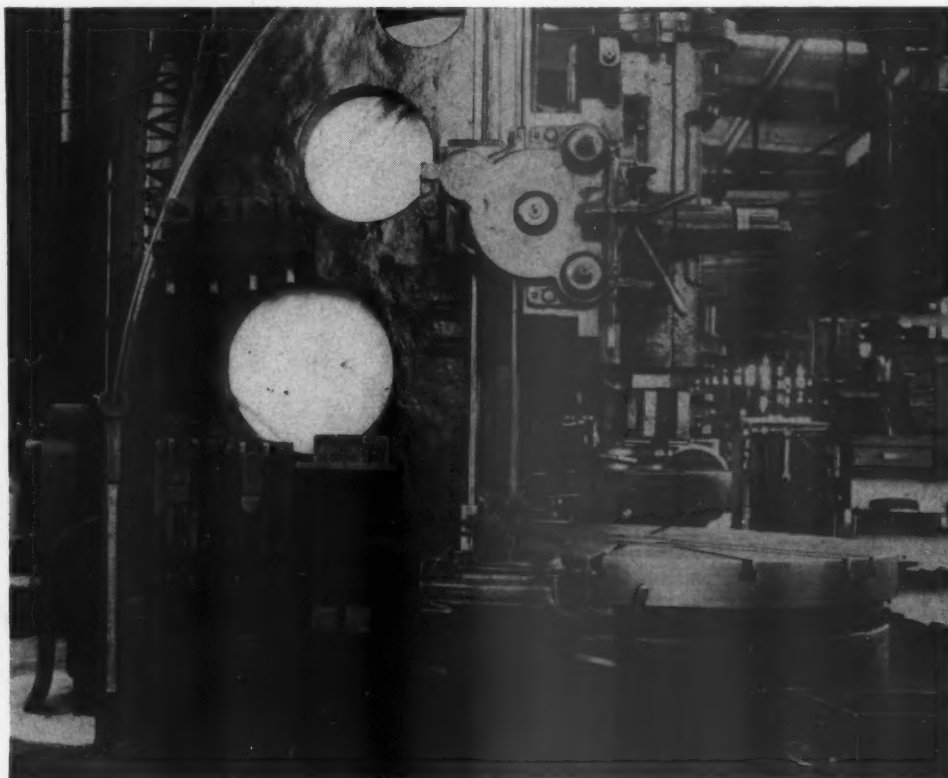
equipment and always having it convenient for use.

One of the illustrations shows how chuck jaws can be suspended from special hooks bolted to the column of the boring mill or other machine where these jaws are used. The hooks consist simply of $\frac{1}{2}$ -in. by 2-in. off-set steel shapes drilled in one leg for the holding bolt or stud and drilled or slotted in the other leg to accommodate the

chuck jaw. Arrangements are made to support not only the chuck jaws but other tools, including the hand set-up wrench, at a convenient elevation where they can be reached without requiring the machinist to bend down and pick them up.

Still another example of this well-proven theory of keeping working materials and tools conveniently available

Right: How chuck jaws and other tools are kept convenient for use at a boring mill—Below: Boring bars are supported in a special rack on the boring-mill column



is shown in the other illustration and consists of a rack designed to support boring bars and be attached to the boring mill column. This rack consists of a piece of $\frac{1}{4}$ -in. boiler steel 14 in. wide by 24 in. long, also bent to a U-shape, but bolted to the machine column with the $4\frac{3}{4}$ -in. legs extending out horizontally. These legs have holes large enough to accommodate the boring bars which are prevented from dropping through by a center bottom strip of $\frac{1}{4}$ -in. by 1-in. steel electric welded $\frac{3}{4}$ in. below the lower leg of the rack.

The rack may be designed to hold as many boring bars as desired and, by making the holes a close fit, the bars will be supported vertically, as illustrated, in a rack from which they may be easily removed.

Mechanized Flue Reconditioning

Last year the Nickel Plate flue shop in Conneaut, Ohio, was rebuilt and mechanized to speed the reconditioning of flues, and eliminate about 50 per cent of the labor previously required to do the work. The shop now turns out a flue about every 34 seconds, and has adequate capacity to supply flues for the entire N.K.P. system.

The key to simplified operations is automatic, mech-

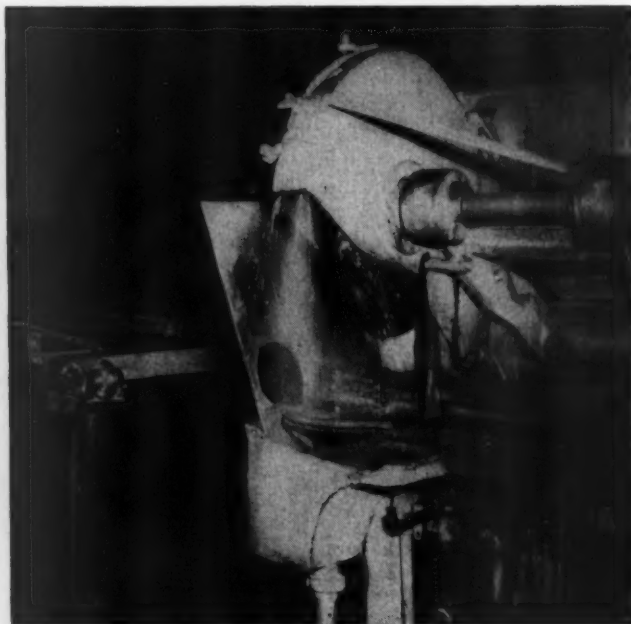


Fig. 1 (left): Endless chain type escalator for loading flues into cleaner—Fig. 2 (right): The flue cut-off saw

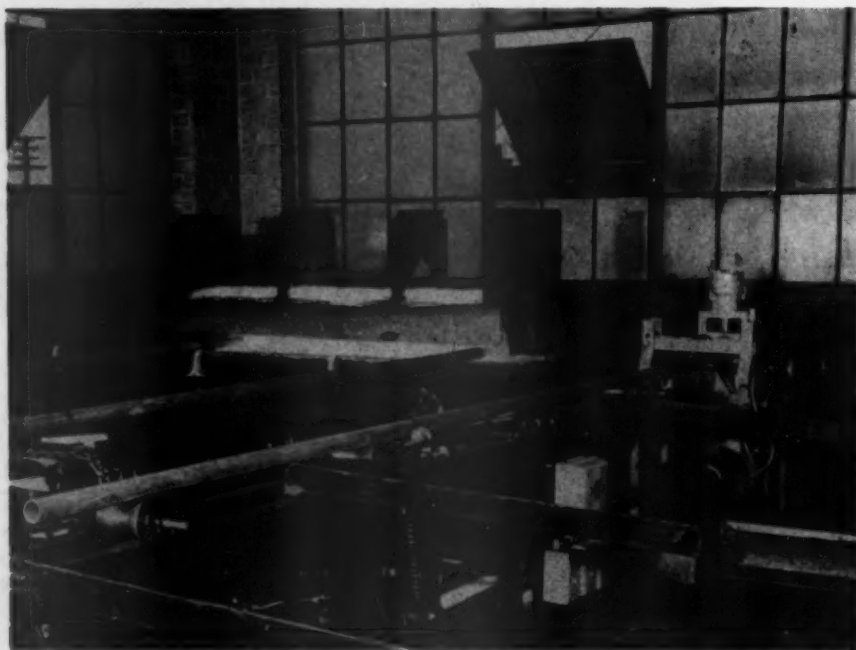


Fig. 3—Equipment for heating and swedging after safe-ends have been welded on

anized handling, largely using air solenoid valves at various steps in the reconditioning process.

The endless, chain-type escalator shown in Fig. 1, is powered by a small air motor. It can load 15 small flues per minute into the flue cleaner, which runs 21 revolutions per minute for two hours with a constant flow of water going over the flues.

From the cleaner, the flues are moved, one at a time, longitudinally on a roller type conveyor until they strike a paddle on the saw bed. Striking the paddle closes a control switch and energizes a solenoid valve admitting air to the lower end of a cylinder which operates the saw, starting it in downward motion for the cut off, as shown in Fig. 2. At the end of the downward stroke of the saw, the solenoid valve admits air to the opposite end of the cylinder, lifting the saw. The roller conveyor is then reversed, withdrawing the flue, and another auto-

matic control admits air to a cylinder that powers ejection of the flue piece from the saw table.

A new piece or safe-end is applied by means of an electric flash welder which is manually operated. The weld is then smoothed in air-operated rolls and passed by roller conveyor to the opposite end of the shop. There an air cylinder lifts the flue onto a chain-type conveyor which carries the flue to the equipment shown in Fig. 3. Here the end of the flue with the new piece applied is moved through the oil-burning furnace in the corner. After heating, the weld is swedged in the roller-type swedge shown at the right. Air solenoid valves aid in automatic handling of the flue through swedging and finally racking of the completed flue, over the tracks shown at the right in Fig. 3.

(Data and photographs courtesy of Compressed Air and Gas Institute.)

Cleaning Diesels On the G. M. & O.

A careful survey develops standard procedures which are employed with desired results on system-wide basis

At the present time, the G.M.&O. operates 243 Diesel locomotives, including 132 freight, 16 passenger units, 12 passenger-freights, 83 switch and 8 Diesel-electric motor rail cars. After becoming fully Dieselized and under pressure to keep maintenance expense down in spite of spiraling labor costs it was found that the cleaning of Diesel locomotives was sometimes sacrificed. This condition of poor housekeeping not only affected the overall appearance of Diesel power but above all contributed to fire hazards and inefficient preventive maintenance.

Although all G.M.&O. personnel concerned with the maintenance of Diesels were aware of the importance of maintaining clean equipment, it was finally realized that in developing overall maintenance programs, the cleaning instructions had been badly neglected.

The Cleaning Problem Surveyed

It was decided to make a survey of the entire railroad, studying the availability of Diesels at different terminals for maintenance and the manpower available to perform the work. A study was also made of the different types of cleaning materials available and methods of application, giving preference to cleaning equipment and material which would clean satisfactorily with a minimum amount of hand labor.

Fourteen terminals were selected to perform heavy cleaning on Diesel units. The cleaning program was divided into three phases: (1) External car body; (2) engine, engineroom and engineroom equipment; (3) underframe (Traction Motors, Trucks, Fuel Tanks, etc.).

Car Body Cleaning—The exteriors of the Diesels are hand washed using an acid type cleaner, and rinsed clean with fountain spray brushes. A material was selected which was found least corrosive to metals. Where available the Diesels are run through a conventional car-washing machine with satisfactory results. Some of the Diesels on the main line are washed daily.

Engineroom and Equipment—The engineroom cleaning had been previously handled by hand wiping with occasional hand washing of ceiling and walls. It was found that many places around the Diesel could not be reached by this method. The points that were the potential fire hazards were not being cleaned.

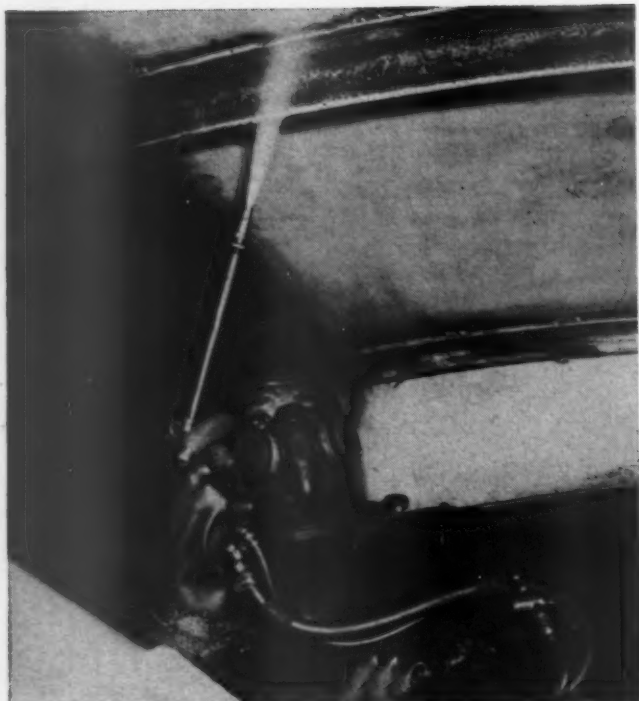
An air-operated spray gun was adopted to apply a mixture of grease solvent material, and mixed with Diesel fuel on practically every square inch of Diesel engine, accessories, ceilings, walls and floor. This material is non-toxic and not injurious to paint. Canvas hoods were placed on several parts of electrical equipment to prevent damage. After allowing material to soak for several



How cleaning solution is applied in back of Diesel fuel pumps with air-operated spray gun

minutes, the same gun is used to spray hot water over all surfaces, removing dirt and soil. The spraying is started at the ceiling and washed progressively down to the floor. It is sometimes necessary to wipe ceiling and walls dry. Engine, compressor, air brake equipment, filter tank, oil cooler, etc. are not wiped. All material on floor is washed out the drains or mopped up. It is expected to include heavy cleaning of interior on the regular monthly form.

Underframes and Gear—The underframe and gear, including fuel tanks, traction motors, trucks, and bottom of the carbody bed are sprayed with a grease solvent type cleaner mixed with Diesel fuel oil. After allowing this material to soak for several minutes, all parts are flushed with hot water or steam under high pressure. Terminals



Engineroom ceiling panels—Light areas have been sprayed with cleaner and rinsed with water



Hot-water and cleaning mixture drums—Air and solution lines have three outlets along the platform



Equipment and fan-type spray used in applying cleaning solution to trucks and other underneath parts

that already had high pressure truck-cleaning apparatus continue to use this equipment for flushing.

A trained crew spent several days at each terminal, supervising the installation of necessary equipment and training the cleaning forces. This results in uniform cleaning procedures at all terminals. Daily reports are



How Diesel locomotive exteriors are cleaned at points where a mechanical washing machine is not available

furnished a central office where the progress of cleaning can be closely followed.

The benefits have been many fold. Maintenance forces are better able to make efficient inspection of equipment. The morale of these forces has been improved by cleaner working conditions. Oil leaks are more readily discovered and corrected. It has not been found necessary to increase the cleaning forces to accomplish this extra work. Management furnished the necessary equipment, cleaning material and cleaning procedure. The maintenance forces do the work.

ELECTRICAL SECTION

A Three-in-One Type of Wheel Protection Tried on Diesels

Controller developed by the American Brake Shoe Company protects locomotives from damage due to spinning, sliding or locking of wheels

A NEW type of American Brake Shoe Controller has been applied for test on Diesel-electric locomotives in revenue service on the Chicago & North Western, New York Central and Pennsylvania. Its performance is being followed by Association of American Railroads committees interested in the subject. The controller employs rotary switches mounted on the locomotive axles. Control starts the instant slipping begins, so that the protection or warning is immediate under all conditions. The controller circuit is independent of other equipment and functions even though the Diesel unit is cut out. The equipment will perform the following three functions: (a) detect spin promptly at all speeds and provide a circuit which can be used for correction; (b) detect slippage or sliding during braking and close warning circuit; and (c) give continuous warning if a wheel becomes locked, fuse fails or device is inadvertently shut off.

The operation of the device is based on the fact that the wheels in the same unit rotate at substantially the same speed unless there is slipping at the contact of the

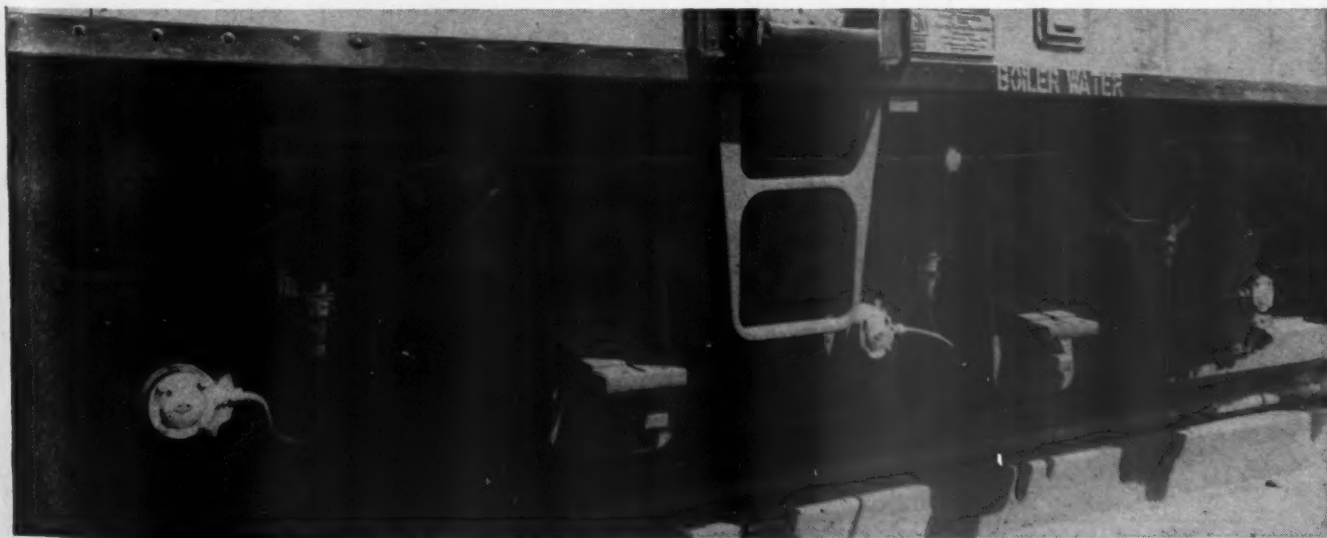
wheel with the rail. The instant slippage begins, the pairs of wheels will rotate with an abnormal difference in speed, signaling a need for correction. The control or warning will begin when there is a 4- to 5-m.p.h. difference, regardless of the speed at which the locomotive is being operated.

The equipment required for the protection of Diesel wheels, Fig. 1, is the same for the A or B unit. The same type equipment can be applied to a unit having four- or six-wheel trucks and is as follows: (a) rotary switch—one for each pair of wheels; (b) relay panel—one per unit; and (c) test switch—one or two per truck.

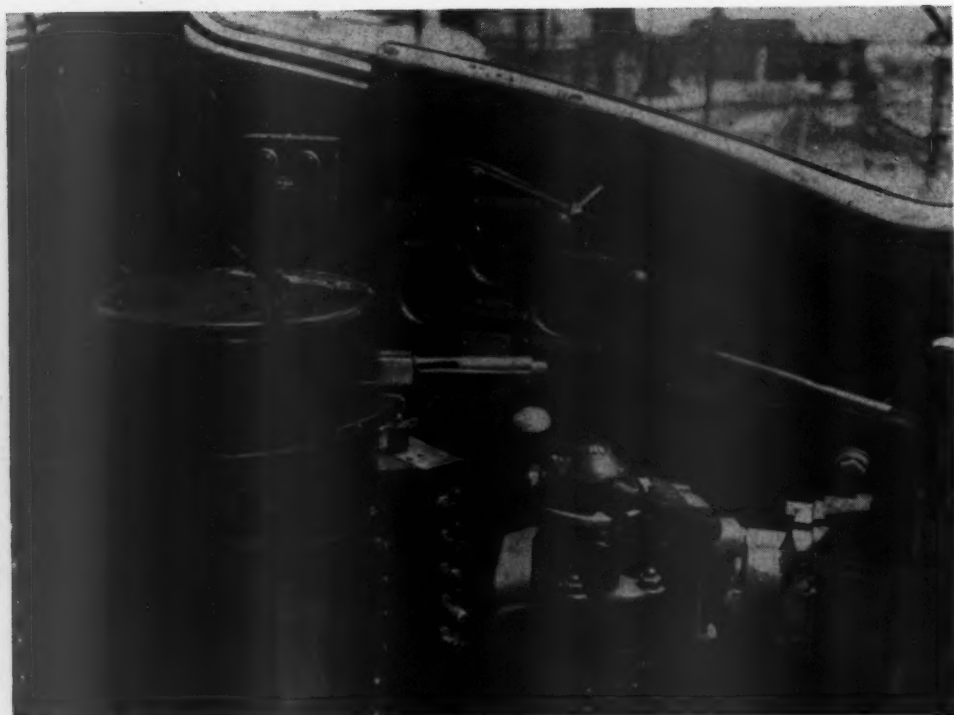
The rotary switch consists of a rotor (brush holder) which turns with the wheel and wipes brushes in contact with a stationary commutator. The switch generates no current; it functions to pass a circuit from battery to relay panel.

The rotary switch fits a standard mounting and drive on roller journals and is applied at one end of each axle.

It may be mounted on any of the several types of



Rotary switches applied to motor-driven and idle axles of a six-wheel truck on a Diesel-electric locomotive



Control position of one of the locomotives with the A.B.S. Controller—The indicating light is shown by the arrow

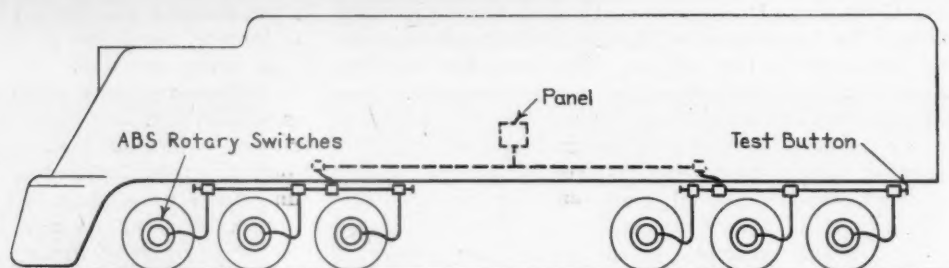


Fig. 1—Diagram showing typical installation

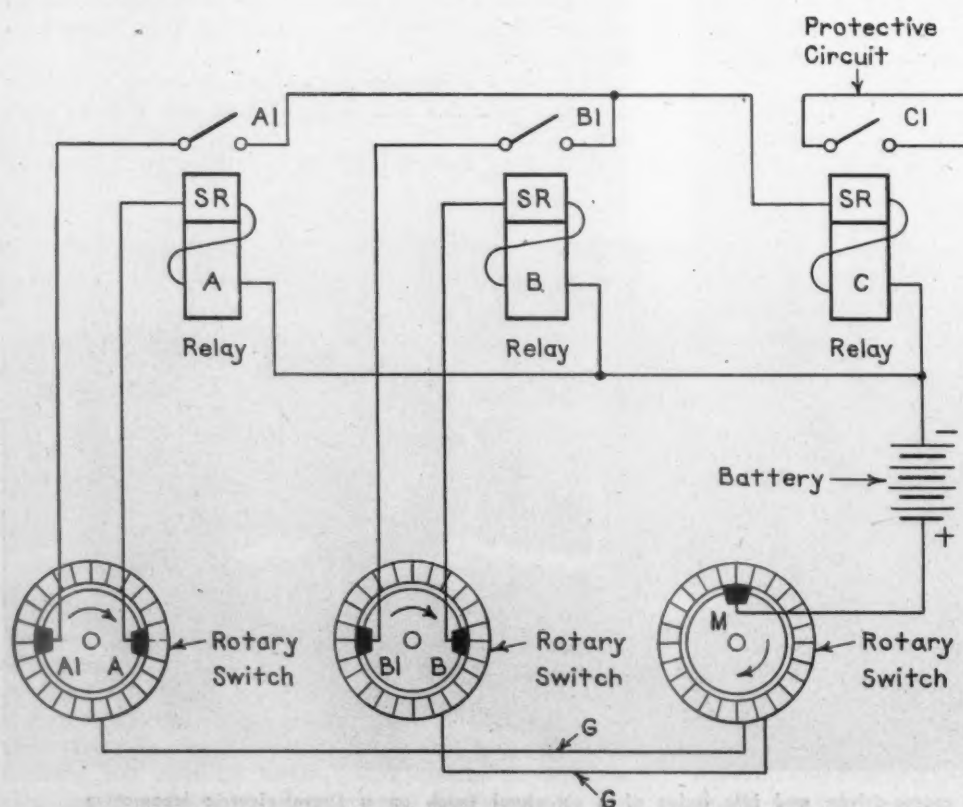
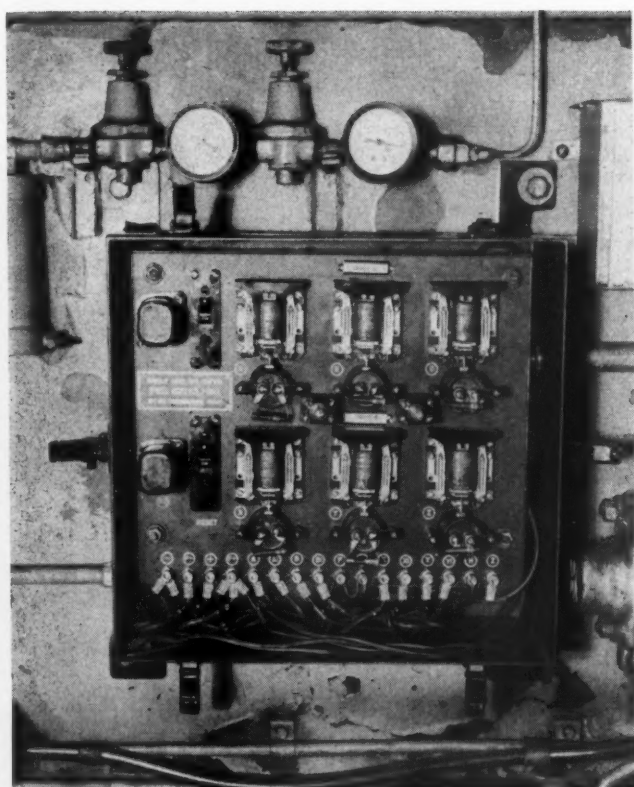


Fig. 2—Basic circuit for protecting 66-wheel truck



Relay panel for a Diesel-electric locomotive with two six-wheel trucks

journal roller bearings when they are equipped with a mounting face and axle drive fittings. Illustrations show a typical rotary switch.

The relay panel is connected to the battery on the unit and should be located in or near an electric locker.

Rubber shockproof mountings are provided inside the panel box. Each relay is double contacted and protected by a metal guard. A light on the panel shows operations of the control circuit. A truck test switch simplifies routine inspection of American Brake Shoe equipment.

For purposes of illustration, the controller circuit is described as applied to a six-wheel truck. The rotation of wheels in the truck is compared as a basis of control and the device on each truck operates independently of the other. It will be noted that idler wheels, as well as driver wheels, are protected.

The principle is the same on Diesel units having two four-wheel trucks, except that the rotation of all wheels is compared and the device operates as if controlling an eight-wheel truck.

For Six-Wheel Trucks

The controller for a six-wheel truck, Fig. 2, consists of a rotary switch for each axle, plus a pair of timing relays, *A* and *B*, and a control relay, *C*, located on a panel in the electric locker. Each rotary switch has a rotor, driven by the axle, and wiper brushes in contact with a stationary commutator. The corresponding segments (bars) of each commutator, as partially shown by conductors *G*, are electrically connected, which makes each point (segment) on one commutator electrically the same as the corresponding point on the other. The rotors, therefore, are, in effect, rotating in cooperation with the same commutator so that a brush of one rotor is electrically connected to a brush of the other when the brushes are rotating in the same relative position.

The winding of timing relay *A* is connected to brush group *A* in one of the rotary switches and, similarly, the winding of an identical timing relay *B* is connected to brush group *B* in another of the rotary switches. The battery is connected to a brush group, *M*, in the third rotary switch.* When brush group *M* is rotating in the
(Continued on page 585)

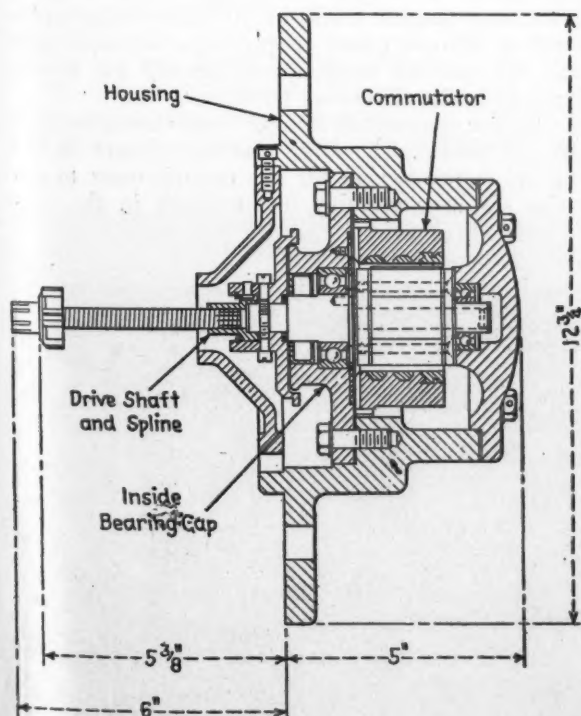
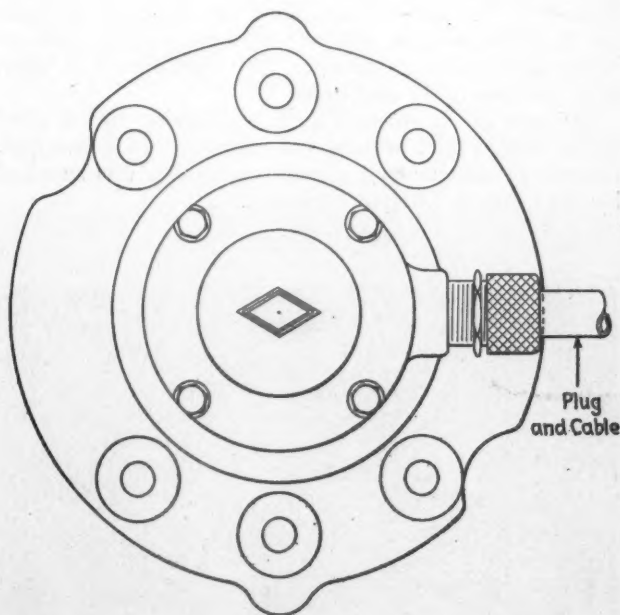


Fig. 3—Rotary switch designed for standard mounting on roller journals at one end of each axle





Long windows and sleek lines give the cars a pleasing appearance

New York Central Installing 100 Air-Conditioned M.U. Cars

Cars built by the St. Louis Car Company have motors on all axles with control graded through twenty steps

A TOTAL of 100 air-conditioned cars are now going into service on the electrified lines of the New York Central, operating out of the Grand Central Station, New York City, to Croton, N. Y., and North White Plains, N. Y., respectively. They are designed to operate from the existing 600-volt third-rail system, and are being used to supplement the 351 cars placed in operation between 1907 and 1930.

All cars are motorized, each one having two 4-wheel trucks with 36-in. wheels and roller journal bearings. Electric propulsion and control equipment was supplied by the General Electric Company.

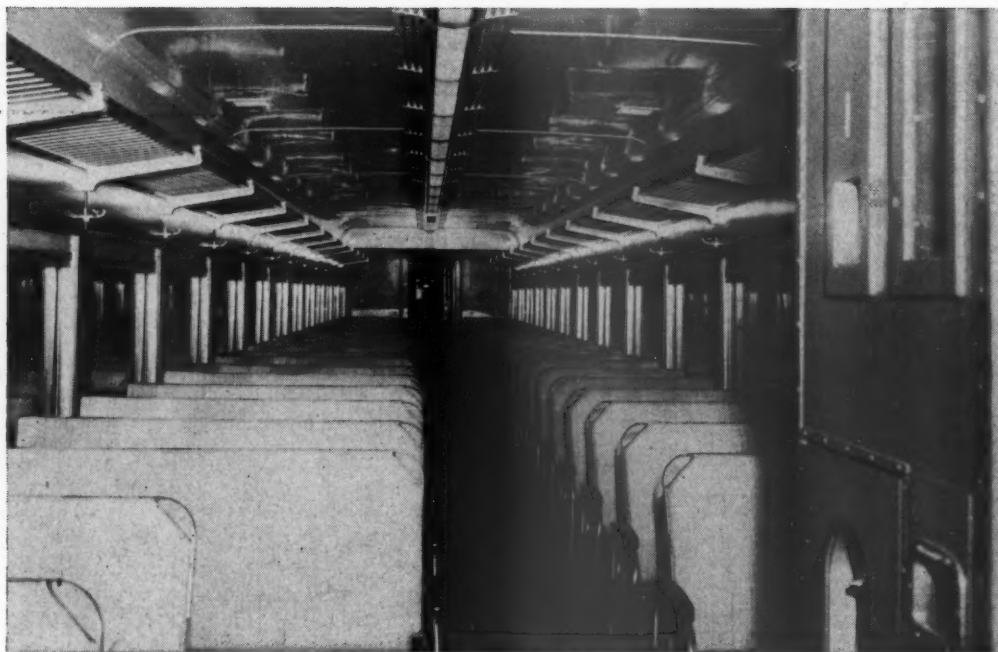
Trains will be made up of from two to 15 of the new cars. The control is set to provide an average acceleration of 1.5 m.p.h.p.s. on a five-car train, without passenger load. This train could have a free-running speed, on level tangent track, of 70 m.p.h. when operating with a 600-volt power supply from the third rail; however, the railroad restricts multiple-unit car speeds to 60 m.p.h. in its electrified territory.

The cars are constructed of high-tensile-low-alloy steel and are all welded. The large number of cars in the order made it practicable for the manufacturer to develop jigs and use assembly line methods in the con-



Air conditioning condenser and motor-driven compressor with guard screen removed

Car interior showing seating arrangement and fluorescent lighting



struction of the cars. This insured uniformity of product and reduced cost of manufacture. Underframes, sides and roofs were prefabricated and assembled. Jigs were also used to assemble and fabricate overhead air-conditioning ducts and lighting troughs. Undercar equipment was mounted with the underframe upside down so that all this work could be done "down-hand," avoiding overhead operations.

The general dimensions of the car are as follows:

Length over coupler pulling faces.....	85 ft. 0 in.
Truck centers	59 ft. 6 in.
Width	10 ft. 4 in.
Height, rail to top of roof.....	13 ft. 6 in.
The scale weight of the car is.....	150,000 lb.

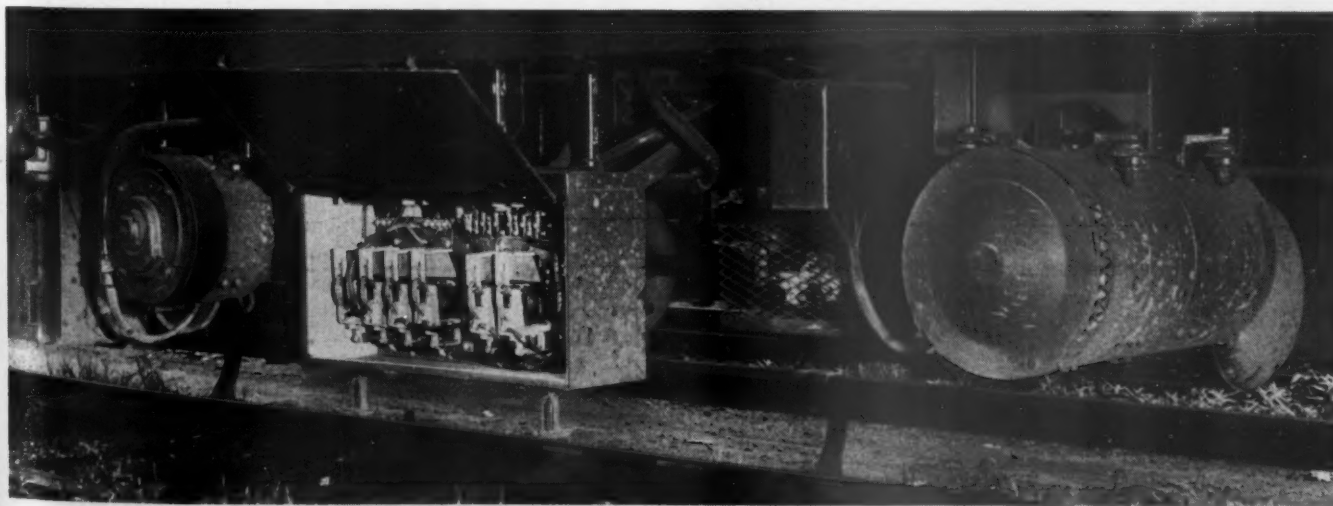
The car has a vestibule at each end, with operating cabs on diagonal corners. This arrangement is used to provide for double-end operation. The vestibule is entirely open when the controls are in use, and a swinging

door opens the control position and closes the front vestibule opening. A sliding door separates the vestibule from the car body when it is being used.

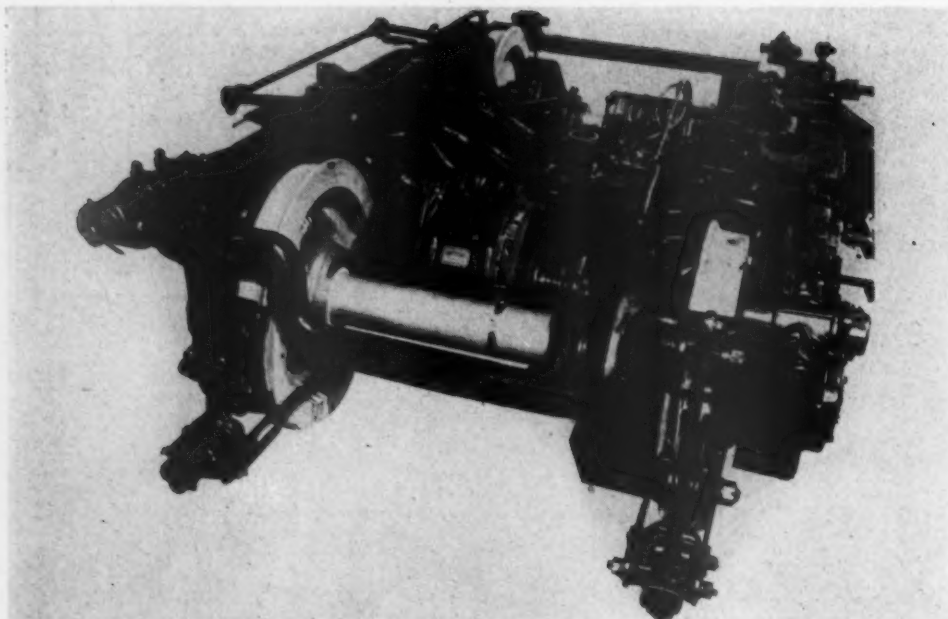
To afford the best possible ride, General Steel Castings Corporation's four-wheel cast steel trucks have been used, with all coil springs, 8-ft. 0-in. wheelbase, and equipped with horizontal bolster stabilizer, vertical shock absorbers and anti-friction journal bearings. The car is also equipped with tight-lock couplers and rubber draft gear.

Since the car is air conditioned, it has double glazed large stationary windows, each window spanning two passenger seat spaces.

The seats are reversible and are spring upholstered and rattan covered. The car will accommodate 130 passengers, using an arrangement of three-passenger seats on one side of the car, and two-passenger seats on the other side. The width of the three-passenger seats is 4 ft. 11 in., and the two-passenger seats are 3 ft. 4 in. wide. The distance between seat centers is 2 ft. 8 in. A toilet is located at one end of the car. It is equipped with



Left: The 2-kw. motor-alternator for the fluorescent lights—Center: The contacts which control the low-voltage circuits—Right: The 4-kw. m.g. set which supplies 75-volt, d.c. power



Truck showing frame-mounted motors with flexible drive

flush hopper and lavatory supplied with water from an overhead, stainless steel gravity tank. An electric water cooler is recessed into the toilet partition.

A careful selection of colors for the interior painting and trimming of the cars makes them most attractive. The first fifty of the lot will have a blue-green combination interior color scheme, while the interiors of the last 50 will be done in an all-brown combination.

Motors and Control

The motive power and control equipment supplied by the General Electric Company includes four truck-mounted motors with single reduction gears through flexible drives between the motors and the gear cases, the latter being mounted on the axles. Current is collected from the third rail by shoes mounted on the truck equalizers, one shoe at each corner of the car.

The traction motor application is unique for suburban coaches. It incorporates many improvements which con-

stitute radical departures from previous multiple-unit practice. Four truck-mounted, self-ventilated motors are installed on each car. Each motor develops 100 shaft horsepower at the one-hour rating, when operating with 300 volts across its terminals. The motors are insulated for a nominal operating potential of 600 volts to ground, and the two motors on each truck are permanently connected in series.

The traction equipment includes the motor itself, mounted on the truck transom, a flexible coupling to afford positive drive between the motor and gear unit, and a single-reduction gear unit complete with hanger assembly. One complete motor-gear unit equipment weighs slightly less than 2,400 lb.

This four-pole, d.c., commutating pole motor has been designed especially for suburban service with a view to providing maximum capacity with minimum weight. The frame is of the rolled plate type, fabricated to give light weight, and top covers are provided with expanded metal to allow free air flow through the machine. The armature shaft is fitted, on the commutator end, with a ball bearing contained in a cartridge type enclosure, and on the drive end with a roller bearing. Grease lubrication is used in conjunction with all-metal labyrinth seals.

Arrangement of the car underside is simplified by virtue of the fact that self-ventilated motors are used. This eliminates the necessity of running numerous air ducts under the coach from separate blowers to the traction motors. The ventilating air is drawn in through protected openings in the upper commutator cover and distributed in two paths. One air stream passes under the commutator and through the longitudinal ducts in the armature core, while the other passes over the armature and around the field coils. A fan expels these two streams of air through openings in the frame.

The motor torque is transmitted to the wheels through a flexible coupling and rubber-supported gear and pinion assembly. The coupling is of the double, internal-external gear type, which acts as a spline and permits vertical and horizontal misalignment. The external teeth on the coupling pinions are crowned so that they can swivel freely in any direction with respect to the internal teeth on the sleeve through an angle equal to



Plug and receptacle for connecting control circuits between cars

Car underframe upside-down in builders shop for apparatus—Left: air compressor and tanks—Center: compressed air radiators—Right: battery box and housings for air conditioning equipment



the maximum angular misalignment capacity of the coupling. The coupling is grease-lubricated. Flexible synthetic rubber seals, fitting snugly around the motor and gear unit pinion shafts, are provided to retain lubricant and exclude dirt.

The fabricated steel gear housing is supported on the axle by roller bearings. The pinion shaft is connected to the flexible coupling at one end and runs in two roller bearings mounted in the gear housing. The transom end of the housing is supported from the truck frame by a rubber cushioned hanger. A ground brush is used to by-pass propulsion current around the roller journal bearings.

The gear and pinion mesh, as well as the bearings, are oil-lubricated by a combined splash and dip system.

Many features incorporated in this equipment will help eliminate a number of problems associated with older types of multiple-unit car equipment. The use of four motors per car eliminates all idle axles. Consequently the required accelerating tractive force is obtained at a low value of adhesion which reduces the tendency to slip under unfavorable rail conditions. Dis-

tributing the motor weight over all axles, instead of concentrating it on two, gives a definite advantage. This, coupled with the use of truck-mounted instead of axle-hung motors, reduces the associated unsprung axle loading. As a result, road shocks are minimized, which means better riding qualities and reduced maintenance on motor and truck parts. The use of completely self-contained, roller-bearing gear units with solid helical gearing minimizes noise and vibration. Oil lubrication of both gears and bearings insures long, quiet, dependable service.

The propulsion control equipment is General Electric Type PCM, and includes two steps of field shunting. The traction motors are controlled by an electro-pneumatic mechanism which operates a camshaft to positively open spring-closed resistor contactors. This method of commutating the accelerating resistance insures positive sequence without the use of elaborate mechanical or electric interlocking schemes.

The electro-pneumatic controller on each car in a train is operated from the master controller in the engineer's cab of the leading car, by energizing the proper train

One of the batteries with (left) box cover removed, and (right) inspection panel open



PARTIAL LIST OF MATERIALS AND EQUIPMENT ON THE 100 MULTIPLE-UNIT CARS

Truck side frames; platform	
center sills; etc.	General Steel Castings Corp., Granite City, Ill.
Wheels and axles.....(50)	Bethlehem Steel Co., Bethlehem, Pa.
	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Journal bearings.....(30)	Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
	(15) SKF Industries, Inc., Philadelphia, Pa.
	(40) Timken Roller Bearing Co., Canton, Ohio
	(15) Waugh Equipment Co., New York
Clasp brakes.....	American Steel Foundries, Chicago
Air brake and signal equipment.....	New York Air Brake Co., New York
Compressed-air radiators.....	Wilson Engineering Corp., Chicago
Brake shoes.....	American Brake Shoe & Foundry Co., New York
Hand brakes.....	National Brake Co., New York
Couplers, coupler yokes, etc.....	National Malleable & Steel Castings Co., Cleveland, Ohio
Draft gear.....	Waugh Equipment Company, New York
Shock absorbers.....	Houdaille-Hershey Corp., Houdaille Engineering Div., Buffalo, N. Y.
Equalizers.....	Camden Forge Co., Camden, N. J.
Equalizer springs.....	Crucible Steel Co. of America, New York
Center plate pads; equalizer coil spring pads; body side bear- ing pad; buffer side stem sleeves; journal box pads; coupler carrier pad.....	Fabreka Products Company, Boston, Mass.
Swing hangers; swing hanger bars.....	Kropp Forge Company, Chicago
Bolster springs.....	American Locomotive Co., Railway Steel Spring Div., New York
Floor, Chanarch.....	Morton Manufacturing Company, Chicago
Floor, composition.....	Tuco Products Corp., New York
Floor covering.....	Armstrong Cork Co., Lancaster, Pa.
Vestibule floor covering.....	American Abrasive Metals Co., Irvington, N. J.
Sash retainer frames; vestibule door drop sash.....	Adams & Westlake Co., Elkhart, Ind.
Trap doors.....	Morton Manufacturing Co., Chicago
Weatherseal.....	O. M. Edwards Co., Syracuse, N. Y.
Seats.....(50)	Industrial Rubber Goods Co., St. Joseph, Mo.
	Coach & Car Equipment Co., Chicago
	Heywood-Wakefield Co., Gardner, Mass.
Window wipers.....	C. A. Sprague Devices Co., Michigan City, Ind.
Window-sill capping.....	Westinghouse Electric Corp., Pittsburgh, Pa.
Glass—operator's windshield.....	Libbey-Owens-Ford Glass Co., Toledo, Ohio
Glass—sash.....(50)	Libbey-Owens-Ford Glass Co., Toledo, Ohio
	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Locks.....	Yale & Towne Manufacturing Company, Stam- ford, Conn.
Luggage racks.....(50)	Adams & Westlake Co., Elkhart, Ind.
	E. A. Lundy Co., New York
Doors; end door curtains.....	Morton Manufacturing Co., Chicago
Side window curtains.....	Adams & Westlake Co., Elkhart, Ind.
Door hangers.....	Elcon Co., New York
Door hardware.....	James L. Howard & Co., Hartford, Conn.
Battery.....	Edison Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J.
Motor alternator and starter; carbon pile lamp regulator.....	Safety Car Heating & Lighting Co., New York
Circuit breakers.....	Westinghouse Electric Corp., Pittsburgh, Pa.
Motors and gear units; electrical propulsion and control equip- ment; lamps.....	General Electric Company, Schenectady, N. Y.
Headlight equipment.....	Pyle-National Co., Chicago
Light fixtures.....	Luminator, Inc., Chicago
Marker lights.....	Lovell-Dressel Co., Arlington, N. J.
Switches.....	Fenwal, Inc., Ashland, Mass.
Thermo.....	
Dimming, transfer and vesti- bule light.....	General Electric Co., Schenectady, N. Y.
Marker light.....	Arrow-Hart & Hageman Electric Co., Hart- ford, Conn.
Main and control.....	Westinghouse Electric Corp., Pittsburgh, Pa.
Terminals (solderless).....	Aircraft-Marine Products Co., Harrisburg, Pa.
Air-conditioning equip- ment.....(50)	Frigidaire Div., General Motors Corp., Day- ton, Ohio
	(50) E. A. Lundy Company, New York
Air-grille filters.....	Air-Mare Corp., Cleveland, Ohio
Uni-Flo grilles.....	Barber-Colman Co., Rockford, Ill.
Aerofuse outlets; Aerovane grille.....	E. A. Lundy Co., New York
Heating and air-conditioning temperature control equip- ment.....(70)	Detroit Lubricator Co., Detroit, Mich.
	Vapor Heating Corp., Chicago
	(30) Sheffler Gross Co., Philadelphia, Pa.
Cab heaters; floor heaters; electric heating banks.....	Railway Utility Co., Chicago
Bell cord and hooks.....	James L. Howard & Co., Hartford, Conn.
Fire extinguishers.....	Buffalo Fire Appliance Corp., Dayton, Ohio
Hoppers.....	Dayton Manufacturing Company, Dayton, Ohio
Latches— toilet door.....	Russell & Erwin Div., American Hardware Co., New Britain, Conn.
Lavatories.....	Crane Co., Chicago
Paint—interior.....(50)	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
	(50) Sherwin-Williams Co., Cleveland, Ohio
Paint—exterior.....	E. I. du Pont de Nemours & Co., Wilmington, Del.
Ticket holders.....	Adams & Westlake Co., Chicago

wires. During acceleration, the traction motors on each car are first connected all four in series and the resistance is cut out in nine steps so as to provide smooth acceleration. The progression of the electro-pneumatic controller from step to step is governed by an accelerat-

ing relay which holds constant current through the motors. The circuits are so arranged that, after transition from series-parallel motor connections, acceleration is continued by rotation of the controller cam-shaft back through the nine steps to its original position. A notching relay enables the engineman to arrest the accelerating progression by moving the master controller handle back one notch. This feature has been incorporated to approximate the operation of controllers on the cars already in service.

Two steps of field shunting are provided when the motors are in the final running position: two in series, two groups in parallel. This gives a total of 20 steps, double the number on the older cars. After all accelerating resistance has been cut out of the circuit, the four field-shunting contactors automatically close, inserting suitable resistance and inductance in parallel with the main motor fields. The first step of field shunting is controlled by the accelerating relay, and the second by the field shunting relay.

A master controller is installed in each operator's compartment. These compartments are located at diagonally opposite corners of each car, enabling the cars to be used in any desired combination. The design of this controller embodies many desirable features which have already been tested on other modern equipments. It is of the cam-operated, individual-switch type, and is equipped with a safety control tip-up operating handle which acts to remove power and apply emergency brakes if the pressure of the engineer's hand is released. The controller has five positions: *Off*, *Switching*, *Series*, *Series-Parallel*, and *Field Shunting*. A special reverse-handle locking mechanism is used so that the same key will lock and unlock controllers on both new and old cars.

A pair of line breakers, working in conjunction with the master controller, initially closes the traction motor circuit, and also acts to break the circuit when control power is removed. This device consists of two electro-pneumatic contactors connected in series to afford satisfactory line current interrupting characteristics. It also serves to protect the traction motors against overloads and power interruptions.

An unusual feature of these cars is the use of a circuit-breaker as a main switch and the installation of circuit-breakers in the control and lighting circuits wherever possible. These breakers are of the Westinghouse Delon type.

The control includes a high-speed potential relay which is energized as soon as the collector shoes contact the third rail, and which is adjusted to drop out if the line potential falls below a certain value. When the relay contacts open, the main circuits are interrupted and the motor controller automatically moves to the *Off* position. This prevents restoration of line potential on the motors until the full value of starting resistance is in the circuit.

The brake equipment is a combination of automatic and electro-pneumatic air brake systems. It employs the D-22-BR control valve, and includes electro-pneumatic features for high-speed operation. The electric portion of the brake equipment consists of two magnet valves on each car, and controlled by the operator's brake valve on the head car. This arrangement insures simultaneous operation on all cars of a train. Air pressure is maintained by a 600-volt, single-stage air compressor having a piston displacement of 35 cu. ft. per min.

The cars are heated by electric heaters mounted along each side of the walls just above the floor level and also



Control position—There is one at each end of the cars

by a bank of electric heaters mounted overhead. The total connected heating load is 49 kw. This includes 30 kw. in floor heaters, 17 kw. in the overhead units and 2 kw. in the toilet. The overhead heaters are blown by the fans which are a part of the air conditioning evaporator unit. The air conditioning units have a refrigerating capacity of seven tons.

Fluorescent lights provide a continuous band of light along the center of the ceiling from end to end of the car. The lamps used are 40-watt, 48-in., T-12, 3500-deg. white, instant-start, high humidity. Incandescent lamps are used in the cabs, under lowered ceilings, at ends of car bodies, and for headlights.

A 10hp. motor is used to drive the air conditioning compressor, a 1-hp. motor operates the condenser fan, and a 1-hp. motor drives the evaporator blower. A 4-kw. motor-generator set supplies 75-volt auxiliary power for controls, battery charging and incandescent lamps. The motor of the motor generator set operates on third-rail voltage. A .38-ohm limiting resistor is used in series with the power supply to the above four auxiliary motors, air compressor motor and cab heater. The battery is an Edison A4HW type, having an 8-hour capacity of 170 amp.-hr.

Alternating-current power at 110 volts is used for fluorescent lamps, water-cooler motor, cab-heater motor and cab-defroster glass. This power is supplied by a Safety, 2-kw., 6-cycle motor alternator. The total a.c. load is 1,500 watts, consisting of 1,020 watts for the fluorescent lamps, 60 watts for the cab heater motor, and 180 watts for the defroster glass and 240 watts for the water cooler.

The defroster glass, used for the operator's window, is known as Electropane. It has a coating of stannic oxide which constitutes a conducting surface with a resistance sufficient to develop a 180-watt load at 110 volts. It effectively prevents frost or ice from forming on the glass without the aid of an external heating device.

The cab heater in the operator's cab and the Electropane glass of the window are automatically disconnected by a door switch when the door is closed, shutting off operator's position.

All direct-current lamps are supplied from the 4-kw. control and battery-charging generator through a carbon-pile lamp regulator.

Solderless terminals are used on all No. 12 and No. 14 wire. Larger wires and cables use soldered terminals and connectors.

A Three-in-One Type of Wheel Protection

(Continued from page 579)

relative position of a brush group, *A* or *B*, in one of the other switches, the timing relay connected to that brush group will operate, closing its contact *I*. Each timing relay is adjusted to delay its release for a fraction of a second after the brush groups have rotated from the relative (operate) position for that relay. It will be noted that contacts *I* of the relays *A* and *B* are connected to brush groups *A1* and *B1* in their respective rotary switches.

The spacing of the brush groups *A* and *A1*, also *B* and *B1*, is such that it is impossible to have a circuit completed through them at the same time.

In normal operation (no slippage of wheels) the relative rotation is slow enough for each timing relay to have released before brush *M* can rotate into alignment with the brush group *A1* or *B1* connected to contact *I*, and no operation will occur. However, when wheel slippage occurs, rapid relative rotation of the brushes will cause the circuit from the rotary switch to reach contact *I* before the timing relay has released. The circuit will then pass across contact *I* to operate the control relay *C* which operates the protective circuit.

When slippage is eliminated and normal rolling is restored, the timing relays will again be released before the circuit to contact *I* is closed. Therefore, relay *C* will automatically release as the protective circuit is no longer required. Two or three seconds are usually required for the entire control for a normal slippage of the wheels. Should the slippage continue for a period of time, indicating an abnormal condition, such as a locked wheel, the protecting circuit will become permanently operated by the action of a simple timing device (not shown on basic wiring diagram). A light on the panel box will indicate the unit in trouble. A manual reset is provided inside the panel box for clearing the protective circuit after an emergency warning.

The warning circuit also will be operated if a fuse fails or the device is inadvertently shut off.

The protective circuit from the American Brake Shoe Controller can be connected to the usual slip relay circuit and effect correction of spin through the operation of that circuit. The manner in which the connection is made should be in accordance with the recommendations of the Diesel locomotive builder.

When the equipment is connected in this manner, the existing wheel slip light in the cab will not only indicate each spin correction, but will also indicate slipping or sliding of locomotive wheels during braking. The light will remain on continuously if the American Brake Shoe Controller snaps to the emergency warning position. The circuit can be used to energize additional alarms or set the brakes if desired.

* All rotary switches are identical and may be mounted at any axle on the unit. A single brush group, *M*, is shown in one rotary switch in Fig. 2.

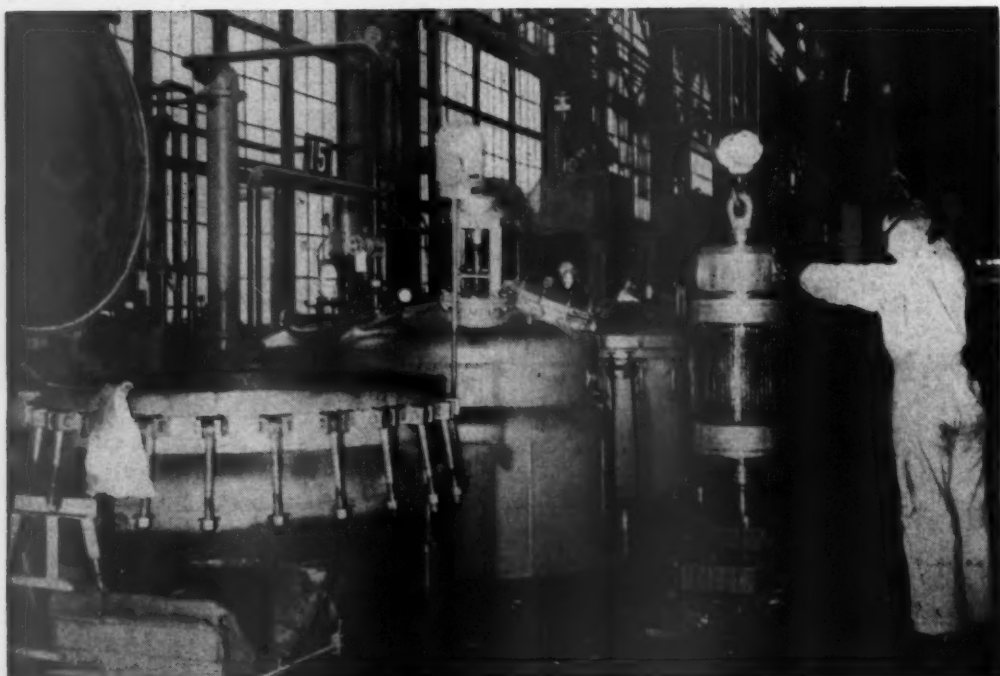
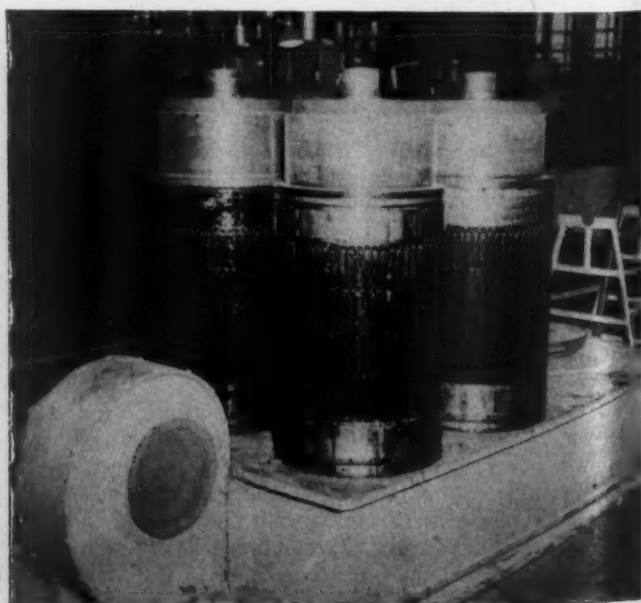
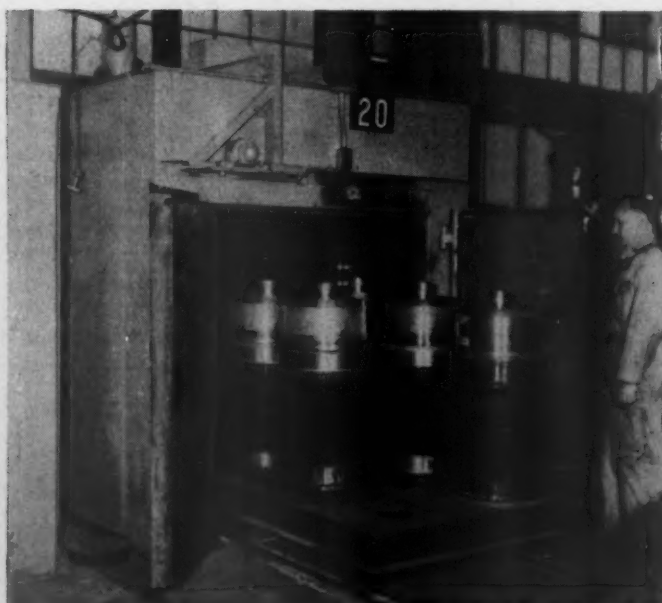


Fig. 1—An armature being removed from one of the two vacuum impregnators

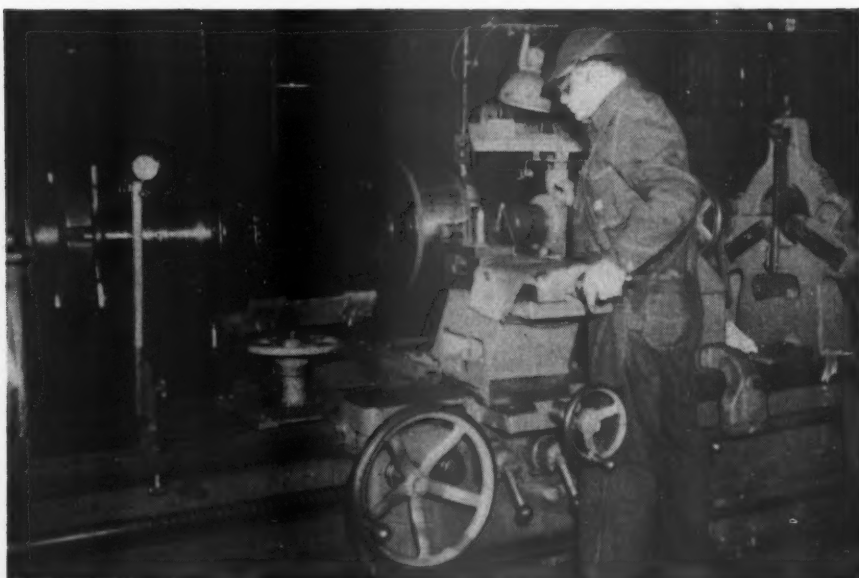
Santa Fe Traction Motor Maintenance Practices

Methods and equipment used in the San Bernardino shops to obtain maximum services from traction motors were developed from experience with locomotives operating under a great variety of conditions



Left: Fig. 2—A batch of armatures going into one of the six ovens
Right: Fig. 3—Blower for accelerating the cooling of armatures

Right: Fig. 4—A 36-in. American Engine lathe, is used for making fine cuts for commutator turning



Below: Fig. 5—A D-7 armature in the Gisholt Dynetric balancing machine



Part II

VARIOUS electric repair shop operations as performed by the Santa Fe in its San Bernardino, Calif., shops were described in the previous issue. These included cleaning, stripping, overhaul of armature shafts, alignment of core slots and commutator bars and winding. Other practices as developed in this shop are described in the following.

Impregnating, Baking and Banding

After soldering, the armature is put in a lathe for cleaning the risers and is retested for shorts and grounds.

The armature is then impregnated two times with the temporary bands still over the coil ends and with the protective ring over the mica still in place. The varnish used does not require heating before impregnation. Armatures are placed in the vacuum tank, and 28 in. vacuum pulled for 30 minutes, after which the varnish is pulled into the tank to the proper level, then the tank of armatures is brought under 25 lb. pressure with CO₂ gas for 30 min. Varnish is pushed back into storage tank, and vacuum is again pulled for 30 min. When the armature

is removed from the impregnator, the excess varnish is washed from iron parts with varnish thinner. The armature is baked out after each impregnation for 12 to 14 hr. at 300 deg. F.

When the armature comes out of the oven for the second time, the temporary ring is removed and end-bell insulation and end bell are applied. The rear coil ends are mudded-in to prevent the accumulation of excess varnish during the third impregnation.

After the armature is cool, the temporary bands are removed and it is put into a banding machine for the application of banding insulation and permanent bands. It is then vacuum impregnated for the third time, and baked for 22 hours at 300 deg. F.



Fig. 6—Retaping and reconditioning of field coils

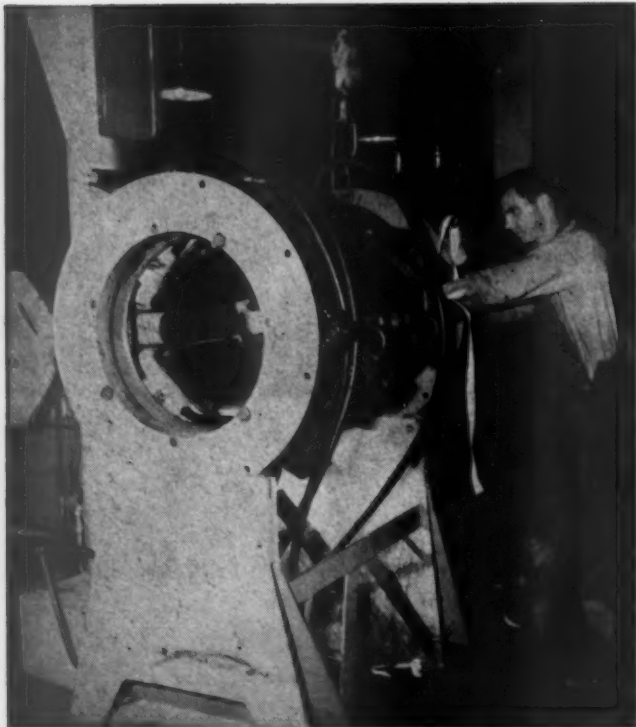


Fig. 7—The positioner used for removing and applying coils and wiring to field frames is shop-made

If necessary, the commutator is tightened while it is still hot. The commutator is then turned, undercut if necessary and burrs removed. The armature is then balanced in a balancing machine.

Pinion fits are gauged and blued. Nothing less than a 90 per cent fit is considered acceptable. The final check on the armature consists of a bar-to-bar and high-pot test after which it is spray-painted.

A record is kept of field-coil mileage and, as motors come into the shop, an inspection is made of the condition of the field coil insulation. It has been the experience of the Santa Fe that most of its Class B insulation reaches the end of its serviceability after about 600,000 miles of service.

The coils are always Megger tested and given a high



Fig. 8—Spray painting a motor field frame in front of the spray booth

potential test. If the insulation is bad, the coils are removed and re-insulated with Class H insulation consisting of silicone-treated glass, silicone-glass, mica-bond tape and Silastic silicone rubber.

When it is not necessary to re-insulate the fields, they are sprayed with varnish. All field coils are megger-tested and hi-potted at 3,000 volts while bolted into the frames.

After coils are reassembled in the field frames, the frames and coils are spray-painted. This is done on the floor in front of a water-backed spray paint booth. The



Fig. 9—Plate and gauge used to check bearing fits on commutator end of motor frames



Fig. 10—Upper end of jig shown in Fig. 9—Dial gauge is used to check both bore and parallel fits

Fig. 11 — Indicating bearing caps and parts for warpage or misalignment



rate at which air is drawn into the booth is sufficient to permit painting at distances up to ten feet from the booth.

Worm brush shaft spindles and holes are refitted by welding up holes and building up bosses on older types. The holes are redrilled for $\frac{1}{2}$ -in. shafts, and the shafts are keyed for large cotter pins at each end. New thimbles are also made for adjusting brush tension on the $\frac{1}{2}$ -in. shafts.

Brush holders are checked for fit and worn brush holders are discarded. Brush spring tension is measured and adjusted to the correct value. New insulators and insulation are applied when necessary.

Bearing Housing Fits

Great care is taken to align and fit bearing housings accurately. Parallel fits on the frame and pinion end of motor frames are not allowed to exceed E.M.D. specifications for tolerance. If they do, they are machined. If one end is machined, the other end also is machined to keep the length between parallel faces up to specifications.

If a bore is oversize, it is built up with metal spray and reground. If too much build-up is required, it is bored to the next size ($\frac{1}{16}$ in. larger). Two rebores, respectively $\frac{1}{16}$ -in. and $\frac{1}{8}$ -in., are permitted. Bearing housing pilots may also be built up with metal spray.

The method used for checking bore and parallel fits on motor frames is shown in Figs. 9 and 10. The motor frame is placed on end with the commutator end down. The bore fit is first checked with a micrometer. This fit seldom shows much wear, but if necessary can be built up.

If the commutator end bearing fit is O.K., a plate which fits the bore is placed into the bore as shown in Fig. 9. The plate has a center into which a ball-bearing is fitted. Resting on the center of the bearing is a shaft which extends upward through the pinion end of the frame as shown in Fig. 10. Four adjustable rods project out from the shaft to touch the bore fit on this end. Above the rods is a rotating arm which carries a dial gauge on its outer end. The gauge may be rotated so that it contacts either the bore or the parallel fit.

With the aid of this gauge against the bore fit, the operator centers the shaft by adjusting the length of the arms. This is done by screwing them in and out of the center ring. The gauge will then show any wear of the bore. With the gauge in the position shown in the illustration

(Fig. 10), it will indicate any warping or wear of the face.

A second dial gauge, also mounted on a rod which may be rotated around the shaft (Fig. 9), is used to check the parallel face of the bearing fit on the commutator end.

Bearing housings and parts are also checked for warpage of parallel faces with a dial gauge in a similar manner. All bores are also micrometered.

Before any fits are built up with metal spray, they are ground out slightly and after building up they may then be ground to size without cutting through the sprayed metal at any point.

Frame housing bore fits are machined or ground out on a horizontal boring mill. Bearing housings are ground on a vertical boring mill.

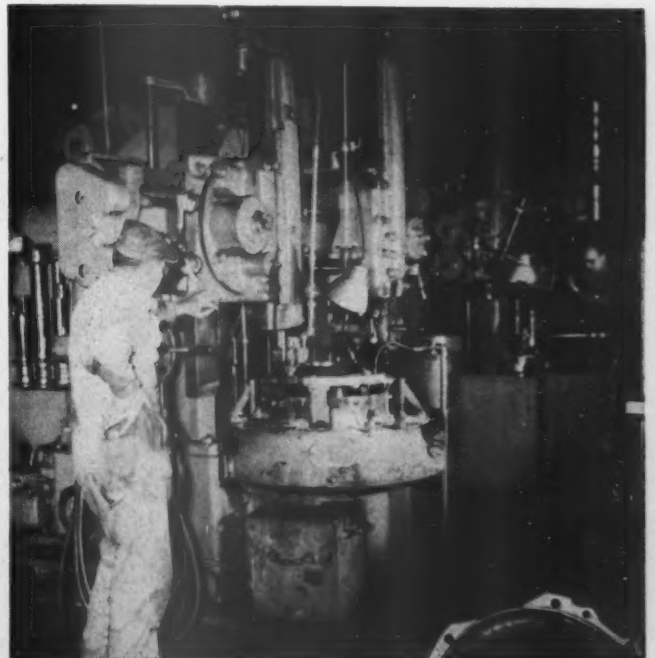


Fig. 12—In the foreground is a 40-in. Colburn boring mill being used for grinding pinion end housings—Beyond it is a 36-in. Bullard vertical turret lathe being used for boring and grinding bearing caps



Left: Fig. 13—Line boring axles caps on one of the two horizontal boring mills

Below: Fig. 14—Testing temperatures of bearings on motor undergoing final running test

Axle bearing cap fits and axle cap spline fits are checked for wear. The spline fits are checked with a feeler gauge when bolted in place.

If necessary the axle bearing cap may be built up with welding and two-inch sections on opposite sides of the axles way in the frame may also be built up. If any welding is done on the frame, it is first stripped and is stress relieved before machining.

Completed assembled motors are run in without load on shop power before they are returned to service. The temperatures of the bearings are checked periodically during this run in.

Shop and Equipment

The electric shop which also includes small motor repair facilities is 74 ft. wide and 447 ft. long. It is served by two 15-ton traveling cranes, fourteen 2-ton wall mounted jib cranes, three 2-ton, 360-deg. jib cranes, two 1-ton, 360-deg. jib crane. Outside the shop, along one wall, there are two 2-ton jib cranes, one over the cleaning stand and the other over the Oakite vats.

Major items of machinery and maintenance equipment used in the shop are as follows:

- 25 horizontal armature stands—plate stands with holes are used for storing armatures awaiting repairs
- 2 armature banding machines
- 1 Lathe used for armature banding
- 6 Large electric ovens for baking
- 1 Small electric oven for heating small parts such as bearing races and oil slingers for shrinking-on
- 1 High-potential testing machine with 15 kva. burnout
- 1 Pot soldering machine
- 2 Vacuum impregnators
- 2 Vertical turret lathes (40-in. and 36-in. respectively)
- 4 Grinders including one for carbide tools
- 1 Welding booth 14 ft. x 18 ft. Also portable welding shield
- 1 Steam-heated cleaning tank 6 ft. x 6 ft. x 12 ft.
- 1 Vapor degreaser
- 3 Welding sets (175-amp.)
- 2 Armature balancing machines



- 2 Commutator undercutting machines
 - 1 Bearing puller
 - 5 Lathes (24-in. to 36-in.)
 - 1 Drill press
 - 1 250-ton hydraulic press
 - 2 Field positioners
 - 2 Horizontal boring and milling machines
 - 1 Steam oven which holds 6 motor frames
 - 1 Double-end buffing wheel
 - 1 Armature commutator line-up table (built by rail-road)
 - 2 Air-operated bearing presses
- Work in the electrical shop is performed under the direction of H. V. Gill, who is superintendent of shops, San Bernardino, Calif. Matt Flory is electrical foreman of the traction motor shop, assisted by L. W. Hoff on the day shift, and Andrew S. Bayus who is night electrical foreman.

EDITORIALS

A Slump in Coal Economy

In a relatively short period of less than five full years the amount of coal consumed monthly in road service by steam locomotives on the Class I railways has declined from 8.2 million tons to 3.8 million tons—more than 53 per cent. In 1945 the monthly consumption in road freight service was 6.3 million tons and in road passenger service, 1.9 million tons. During the first five months of 1950 the monthly average in freight service was 3.2 million tons and in passenger service, 0.6 million tons, a total decline in both services of nearly 4½ million tons a month.

This is one of the striking evidences of the changes which are taking place on the railroads as a result of the rapid increase in the proportion of traffic which is being handled by Diesel-electric motive power. But these figures alone do not tell the complete story of what has been happening to steam-locomotive operation.

During the 12 months of 1941 the average coal consumption per thousand gross ton miles of freight movement was 113 lb. In 1945 the average had increased to 123 lb.; it dropped to 122 lb. in 1949 and was back to 127 lb. during the first five months of 1950. This represents an increase of 8 per cent in 1949 and 12 per cent for the short period in 1950. In passenger service the slump in economy is even more marked; coal consumption per passenger-train car-mile has increased by well over 20 per cent.

One of the reasons for the slump in coal economy during the war was the inability of the railroads to secure an adequate supply of locomotive coal of a desirable quality. The worst of the war-time fuels have since disappeared. But the post-war promise of improvements which would reserve the better grades of coal for locomotive use and utilize the fines in stationary power plants came to naught because of the rapid waning of the interest of the railroads in coal of any quality as locomotive fuel. The quality of the coal in use on many railroads today is far less than the best.

Another cause for the post-war failure to restore coal economy to pre-war levels is the effect of the decreasing proportion of steam locomotive service. The services lost to steam is that which offers the best opportunity for the attainment of high fuel economy and those retained are proportionately high in marginal services which inherently produce low fuel economy.

But with due regard to this condition, there is room for a healthy suspicion that a considerable degree of laxity in the handling and firing of coal has been engendered by the overwhelming shift in interest from such questions as the quality of locomotive coal and of steam

locomotive performance generally to the problems of Diesel locomotive operation.

The effect is concealed to some extent by the steadily declining amount of coal consumed because of the month-by-month increase in the proportion of the service being performed by Diesels. But it is there, none the less, and is costing the railroads money. Even with the reduced amount of coal being used in road locomotive service today, a restoration of the 1941 fuel rates would effect an average reduction in the monthly coal consumption of 450,000 tons—more than 5 million tons a year. Even though only part of this amount can be saved it is worth some effort. The inspiration for such an effort must come from the very top of the organization.

More Intensive Car Use

With the country now experiencing a shortage of freight cars, especially box, gondola, hopper and flat cars, it is important to take every practicable step to increase freight car ownership, concentrate on repairs to cars which can be returned to service with the least possible delay and also get the greatest practicable use out of equipment now in service.

In discussing the subject, "Transportation a Full-Time Team-Work Job" at the initial Fall meeting on September 11 of the Car Foremen's Association of Chicago, C. R. Megee, vice-chairman of the A. A. R. Car Service Division, pointed out that the orders for new cars which averaged about 100,000 units a year in 1947 and 1948 unfortunately dropped to about 9,600 units in 1949 bringing the number of cars on order and undelivered down to 14,300 on December 1, 1949, a low for the decade.

Railroads are now trying to build up their inventory of new equipment by a substantial figure, referred to by Mr. Megee as about 122,000 cars representing an investment of over \$500 million. These cars will not become immediately available, however, so emphasis must be placed on more efficient handling and use of present equipment.

One of the best means of accomplishing this objective is realized to be the prompt repair and return of bad-order freight equipment to revenue service. The organized program for reducing the number of unserviceable freight cars to 5 per cent of the ownership which railroads are now working on is definitely a construction step in the right direction, but one not so easy to carry out. A large amount of additional physical work, ordering of mate-

rials, advance planning by supervision and coordinated effort by all departments is essential and indeed proves a "full-time" job.

In addition to repairing and upgrading cars as promptly as possible after they reach repair tracks, other suggestions are that they be switched and spotted promptly, and that a selective program for placing cars on repair tracks which can be returned to service with the least delay and cost be followed. In this connection, a method of distinctive carding may help indicate to yard forces those cars which should be given preference in movement to repair tracks, the general order being (1) all loads, (2) empties of types most in demand and (3) empties of other types requiring least repairs.

As regards the more efficient use of cars which is so essential under present conditions, continued emphasis must be placed on heavier loading, less delay in loading and unloading, minimizing delays at terminals and on the road, more quick and thorough cleaning of cars after unloading and the full cooperation of all railroad departments involved, as well as shippers, in the attainment of these objectives.

How About Core Loss?

There are those in railroad circles who feel a bit resentful toward the Diesel for the manner in which it is pushing the steam locomotive into the discard. A few seem even to look hopefully for a calamity. They say, for example, "Just wait until the Diesels get old and see what happens to maintenance costs."

In case after case the Diesel has been able to disprove this kind of criticism and in many instances maintenance costs have gone down instead of up. But the situation is not one about which anyone can afford to be smug. Battles swing back and forth and eternal vigilance is the first requisite of victory.

One case in point has to do with the traction motor. Maintainers of road locomotives have anticipated and, in some cases, realized the overhaul of motors at 250,000- to 300,000-mile intervals with rewinds at every third or fourth overhaul. This would result in what has been called the million-mile motor. It would mean that every third or fourth overhaul would be a rewind.

Some operators claim even better performance than this, but the burden of proof is on them. Others acknowledge an increase in the percentage of rewinds, and since they are among the best in the business, it becomes important to discover the reason. It could be the fault of the operating department, but before the maintainers can win such an argument, they must be completely sure of their own ground.

For example, some maintainers are beginning to wonder about core loss. Every time a motor is rewound, coils are removed and core slots are thoroughly cleaned. In the process, laminations can be burred over and shorted. This would cause an increase in core loss and there may be other reasons, including operation under severe vibration. Increased core loss means loss of capacity;

and, what is more important, it means increased heating under a given load.

Perhaps the spectre of increasing core loss is just a bogey-man, but it would seem to warrant some investigation, and it is gratifying to know that at least one shop is setting up test equipment by means of which it can be measured.

How Much Per Pound?

The expected large-volume freight-car buying for the next several years again brings to mind the question of how much additional money can be justifiably spent for each pound of weight saved. The question is timely because the several hundred-thousand freight cars to be built will be running for a long time, and no opportunity to incorporate money-saving features into these cars should be overlooked.

It also seems appropriate to differentiate between the value to be derived from a saving in sprung weight as contrasted with an equal saving in unsprung weight. It might also be worth while to put a monetary value on converting unsprung weight into sprung weight. There are several advantages to keeping unsprung weight to a minimum that overshadow the general value of lightening weight. Chief among these is the reduction of fatigue stresses. While these may not be great in magnitude and may not often cause a load-carrying member to fail, when such a failure does occur it frequently results in a serious and expensive accident.

To take one example, an unsprung side frame receives a great many shock loads. While it requires many stress reversals to cause a side frame to fail, such a failure can cause a bad wreck. The savings, therefore, cannot simply be measured by the increased life of the side frames. A secondary possibility that is worth some thought is that the reduction in unsprung weight can lower the severity of the shocks to the point where the failure will proceed slowly enough to permit discovery before ultimate failure. For example, a part may develop a small crack after inspection yet fail completely before the end of the division, resulting in a train wreck. By reducing the pace at which the failure proceeds, the defect can be discovered and accidents prevented. Just how many is, of course, a matter of speculation, but the possibility is an intangible factor in favor of minimizing unsprung weight.

An attempt to measure the differential of value between reducing sprung weight and unsprung weight before the general question of how much it is worth to save a pound of weight may seem like an attempt to put the cart before the horse. But rather than this detail being merely a fine phase of the overall problem to be settled after the general question of weight evaluation is settled, it is a point that should be studied concurrently with the other factors involved. Any study that has for its purpose the evaluation of weight saving should take into consideration every possible phase of the general subject.

QUESTIONS AND ANSWERS

The question and answer department is included for the benefit of those who may desire assistance on problems involving matters pertaining to the operation or maintenance of air brakes, Diesel-electric locomotives, steam locomotive boilers or steam locomotive practice. Any inquiry should bear the name and address of the writer, whose identity will not be disclosed unless special permission is given to do so. Anonymous communications will not be considered. Inquiries addressed to this publication will be referred to the source from which authoritative answer can be secured.

Diesel-Electric Locomotives*

GENERAL

1-Q.—What do the road locomotives consist of? A.—1600-hp. freight units and 2210-hp. passenger units.

2-Q.—Which units are designated as independent? A.—Those units which are equipped with operating cabs and can be moved independently.

3-Q.—What is the classification of this unit? A.—This unit is known as the *A* unit.

4-Q.—Which units could not be considered independent? A.—Those without operating cabs, the *B* or trailing unit.

5-Q.—Can the *B* unit be moved independently? A.—Not unless it is equipped with hostler controls.

6-Q.—What is used to make up a freight locomotive? A.—Different combinations of 1600-hp. freight units may be used to make up a locomotive.

7-Q.—How is the 1600-hp. locomotive designated? A.—As a single *A* unit.

8-Q.—What is a 3200-hp. locomotive composed of? A.—Either a combination of two *A* units back to back or an *AB* combination.

9-Q.—What comprises a 4800-hp. locomotive? A.—Either a combination *ABA* or an *ABB*.

10-Q.—How is a 6400-hp. locomotive made up? A.—Either an *ABBA* or an *ABBB* combination.

11-Q.—What does a 2250-hp. passenger unit comprise? A.—A single *A* unit.

12-Q.—What is the 4500-hp. locomotive combination? A.—A passenger locomotive comprised of an *AA* or an *AB* combination.

13-Q.—How is the 6,750-hp. passenger locomotive made up? A.—An *ABA* or *ABB* combination.

14-Q.—When a locomotive is made up of several units, does each unit operate independently? A.—No. Multiple units are controlled from one operating cab.

15-Q.—What provides for such multiple unit operation? A.—Control wires and air hoses connect the units to provide for multiple unit operation.

16-Q.—Describe the 1600-hp. road switcher locomotive. A.—A 1600-hp. road switcher is a single-unit locomotive designed for passenger, freight or switching service.

17-Q.—Can this type be utilized for multiple-unit operation?

* This is the first installment of a new series of questions and answers relating to the Alco-G.E. line of Diesel-electric locomotives. The first group of questions and answers are general in nature; subsequent issues will contain others that deal with locomotive parts in detail.—Editor.

tion? A.—Yes. Controls may be applied for multiple-unit operation of two, three or four units controlled from one cab.

DIESEL ENGINES

18-Q.—With what type engine are these locomotives equipped? A.—A *V*-type engine with a 41 deg. angle between the banks.

19-Q.—How many cylinders are built in these engines? A.—The 1600-hp. engine has 12 cylinders; the 2250-hp. engine has 16 cylinders.

20-Q.—What is the bore and stroke of these engines? A.—Bore, 9-in.; stroke, 10½-in.

21-Q.—Describe the engine further. A.—The engine is single acting, turbo-supercharged, of four stroke cycle having an open combustion chamber with solid fuel injection, two intake and two exhaust valves.

22-Q.—How is the fuel supplied? A.—By means of an individual fuel injection pump and nozzle for each cylinder.

23-Q.—What is the engine speed range and how is it controlled? A.—350 to 1,000 r.p.m. and governed by an electro-hydraulic power plant regulator.

24-Q.—What is meant by the term four stroke cycle? A.—Each cylinder requires two engine revolutions or four strokes of the piston to complete one working cycle.

25-Q.—Describe the first stroke of the cycle. A.—First, air is blown into the cylinder on the down or intake stroke by the turbo-supercharger.

26-Q.—Describe the second stroke. A.—On the rising, or compression stroke, this air is compressed by the piston with a large increase in air temperature.

27-Q.—What happens just before the end of this stroke? A.—Just before the end of the compression stroke, fuel is injected into the cylinder where it is ignited.

28-Q.—What causes the fuel to ignite? A.—The heat of the compressed air.

29-Q.—Describe the third stroke. A.—The resulting combustion increases the cylinder pressure which on the third or power stroke forces the piston down.

30-Q.—Describe the fourth stroke. A.—On the fourth or last stroke (exhaust) the burned gases are expelled by the piston traveling upward.

31-Q.—What other important action takes place during

this stroke? A.—Scavenging action by the turbo-super-charger.

32-Q.—What makes this action possible? A.—Large intake and exhaust valve overlap.

33-Q.—How is the engine frame constructed? A.—The engine has an all welded box type steel frame.

34-Q.—What kind of a cooling system is used? A.—A closed cooling system. The cooling water flows successively through the engine, radiators and lubricating oil cooler, circulated by an engine driven centrifugal pump.

35-Q.—How is the water cooled? A.—By means of the fan cooled radiators.

36-Q.—What type lubrication is provided? A.—Full pressure lubrication of all parts is provided.

37-Q.—How is the lubricating oil cooled? A.—By water in the heat exchanger.

38-Q.—How is the engine temperature controlled? A.—Thermostatically controlled modulating type radiator shutters and an eddy current clutch driven fan maintain the desired engine temperatures automatically.

Steam Locomotive Practice

Duplicate Locomotive Numbers

Q.—Is it permissible to have duplicate locomotive numbers assigned on the same railroad? One road is at the present time being Dieselized and with contemplated renumbering program there will be a possibility of having a steam and Diesel locomotive with the same number in the event the steam locomotive is not retired prior to the delivery of the new Diesel?—F. E. V.

A.—The I.C.C. rules do not contain any specific instructions as to the numbering of locomotives. For the purpose of identification and filing of reports the duplication of numbers on the same railroad would not be desirable.

Rule 104: Each locomotive and tender shall be inspected after each trip, or day's work, and the defects found reported on an approved form to the proper representative of the company. This form shall show the name of the railroad, the initials and number of the locomotive, the place, date, and time of inspection, etc.

Interpretations of Rule 104 state:—"The initials of the road need not appear, providing there are no duplicate engine numbers—so long as there is sufficient information properly to identify the locomotive."

The general practice is to assign a new series of numbers for all new equipment when built.

When to Use Hand Holds

Q.—Under what conditions is it necessary to apply toe-boards and handholds along the side of the cab of a steam locomotive?—R. E. V.

A.—It is customary to apply toe boards and handholds along the sides of the cab of a steam locomotive where there is insufficient room between the firebox and the outside of the cab to provide for a door in the front of the cab, as a general practice toe boards are not provided along the side of the cab when a front door opening can be made with a minimum width of 5 in. at the bottom, increasing uniformly to a minimum of 11 in. at a point not more than 39 in. above the top of the deck and the passageway through the cab is unobstructed.

Axles Cracked in Journals

Q.—Is it permissible to use a locomotive axle which has been found to be cracked in the journal?—F. E. R.

A.—The I.C.C. Bureau of Locomotive Inspection Rule 133 provides:

(a) Driving, trailing, and engine truck axles with any of the following defects shall not be continued in service:

(b) Bent axle; cut journals that cannot be made to run cool without turning; seamy journals in steel axles; transverse seams in iron axles, or any seams in iron axles causing journals to run hot, or unsafe on account of usage, accident, or derailment; driving, trailing, or

engine truck axles more than one-half inch under original diameter, except for locomotives having all driving axles of the same diameter, when other than main driving axles, may be worn three-fourths inch below.

It is the general practice when a crack is found in the journal of a locomotive axle to turn down the journal until the crack is removed or the minimum diameter is reached. If the crack can be removed before the minimum diameter is reached the axle is returned to service.

Retinning Aluminum Crossheads

Q.—When retinning locomotive aluminum crosshead shoes, what temperatures should be used for preheating the shoe and for the tinning operation?—F. E. L.

A.—The temperatures to be used when preheating aluminum crosshead shoes prior to retinning and during the tinning operation depends upon the alloy from which the shoe was originally made. For Aluminum Alloy crosshead shoes made from 70S aluminum alloy the temperature of the crosshead shoe during the retinning operation should be within a range of 600 deg. to 700 deg. Fahrenheit. Due to the loss of mechanical strength of the 70S aluminum alloy at elevated temperatures the temperature of the crosshead shoe of this alloy and the tin bath should not exceed 700 deg. Fahrenheit.

What Is Carbon Steel?

Q.—What constitutes carbon steel?—E.F.H.

A.—The Steel Products Manual for Hot Rolled Carbon Steel Bars issued by the American Iron and Steel Institute gives the following explanation of carbon steel:—

"By common custom steel is considered to be carbon steel when no minimum content is specified or required for aluminum, boron, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium or zirconium, or any other element added to obtain a desired alloying effect; when the specified minimum for copper does not exceed 0.40 per cent; or when the maximum content specified for any of the following elements does not exceed the percentage noted: manganese 1.65, silicon 0.60, copper 0.60.

"In all carbon steels small quantities of certain residual elements, unavoidably retained from raw materials, are sometimes found which are not specified or required, such as copper, nickel, molybdenum, chromium, etc. These elements are considered as incidental and are not normally determined or reported."

Driving Box Lubricators

Q.—Are there any practical mechanical devices whereby the oil in the cellar of a locomotive driving box is brought into contact with axle journal?—E. K. F.

*A.—*There are mechanical journal lubricators, which replace the conventional journal box cellars. These lubricators as a rule deliver oil to the journal mechanically when the locomotive is in operation by means of a pump operated by the lateral movement of the driving wheels.

Two-Piece Cab Curtains

Q.—When applying a back slide curtain to the rear opening in the back of the cab of a steam locomotive, is it permissible to use a two-piece curtain parted in the middle of the curtain or is it required that the curtain must open on the fireman's side?—G. F. K.

*A.—*When a slide-back curtain is applied to a steam locomotive it must be of sufficient length and width to cover the opening in the rear wall of the cab. The use of a one-piece or two-piece curtain and manner of opening the slide-back curtain is left entirely to the individual road. As a general rule, one-piece curtains open on the fireman's side and two-piece curtains at the center.

Shrinkage Tolerances

Q.—What are the required shrinkage tolerances for applying tires to locomotive driving wheels, also the out of round tolerances of driving wheel centers before applying tires? Can shims be applied to compensate for the out of roundness of the wheel centers?—R. E. P.

*A.—*The general practice of tire shrinkage allowance is 1/80 in. per foot for 38-in. centers to 1/60 in. per foot for 90-inch centers; increasing uniformly between limits.

Tires should not be mounted on wheel centers that are more than 3/32 in. out of round or have concave or convex faces plus or minus .015. Shims should be avoided wherever possible. Where wheel centers exceed these limits they should be built up with electric weld or other approved process and turned round and concentric.

Exhaust Nozzles

Q.—What is considered the most practical type of exhaust pipe nozzle? What is the purpose of an exhaust nozzle bridge and should the bridge be round or square in cross-section?—F. E. D.

*A.—*Tests conducted at the University of Illinois by Prof. Young, in which practically all designs of exhaust nozzles now in use were tried and the efficiency of each determined by its ability to provide a steam jet which would entrain the greatest volume of air, showed that the ordinary round bore nozzle, when provided with some sort of a spreader or bridge to roughen the steam jet, is for all practical purposes, the equal of any other type.

In the course of the tests various types of exhaust nozzle spreaders were tried and the most satisfactory results were obtained with the square bar cross spreaders. In making the square bar spreader the diagonals of the cross-section of the bar are perpendicular and horizontal.

Schedule 24RL Air Brakes

BREAK-IN-TWO PROTECTION FEATURES

*978-Q.—How does this relay air valve function? A.—*The application insuring relayair valve will cut off control pipe 16 air to chamber D of the cut-off relayair valve and vent it to the atmosphere.

*979-Q.—What is the result of this operation? A.—*The cut-off relayair valve will be prevented from cutting off the actuating chamber of the emergency application portion to the atmosphere.

*980-Q.—What does this insure? A.—*Insures the emergency application piston moving to its applied position to cut off feed valve air supply to the open brake pipe when a break-in-two occurs.

SAFETY CONTROL FEATURE

*981-Q.—When does the Safety Control Feature, as incorporated with 24-RL brake equipment function? A.—*Only in case the engineman fails to hold the foot pedal or the automatic brake valve handle down, (with hinged handle only), without first making a brake application.

*982-Q.—What sort of a brake application must be made to prevent a safety control application? A.—*Unless a brake application has first been made resulting in about 30 lbs. in control pipe 16, a safety control application will occur when the foot pedal or brake valve handle is not held down.

*983-Q.—What does this safety-control feature consist of? A.—*1—A diaphragm foot valve. 2—An H-24 Relayair Valve Unit with a Cut-Off Valve. 3—A Service Brake Application Portion or an Emergency Brake Application Portion. 4—A Volume Reservoir with a Check Valve and Choke.

984-Q.—Where is the diaphragm foot-valve located?

*A.—*In the safety control pipe and having a pedal which is held down to suppress a safety control application.

985-Q.—How does H-24-relay air valve unit function?

*A.—*The unit, with a cut-off valve operates to prevent a safety control brake application when the control pipe 16 is applied with a predetermined pressure of about 30 lbs. permitting release of the foot pedal and brake valve handle (if hinged handle is used).

*986-Q.—What does the Service Brake Application Portion safety control details consist of? A.—*A safety control cock 134, a service application piston 112 and slide valve 114, check valve 351 and brake valve handle 370 (with hinged handle brake valve only).

*987-Q.—What does the Emergency Brake Application Portion safety control details consist of? A.—*A Cut-out Cock in pipe 10, emergency application piston 161, check valve 351 and brake valve handle (if hinged handle is used).

*988-Q.—How does the volume reservoir with a check valve and choke function? A.—*Located in application pipe 10 of the brake valve, they permit the engineman a predetermined time to suppress an inadvertently initiated safety control application by depressing downward either the brake valve handle or the foot pedal of the diaphragm foot valve.

*989-Q.—What other duty does it perform? A.—*It also acts to stabilize the operation of the brake application piston.

*990-Q.—How does the air flow through the service application portion during the charging operation? A.—*Main reservoir air flows into chamber A below service application piston 112, through choke K in the piston to chamber B above the piston, to passage 10 and pipe 10 to the cut-off valve of the relayair valve unit.

NEW DEVICES

Hydraulically Operated Drop Tables

The Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich., has introduced three models of hydraulically operated drop tables. The Type HH is available in any capacity required, with single or multiple tops; it is suitable for servicing Diesel or steam locomotives and operated in the usual deep pit. The Type H, a shallow pit table, requires a pit only 4½ ft. deep.

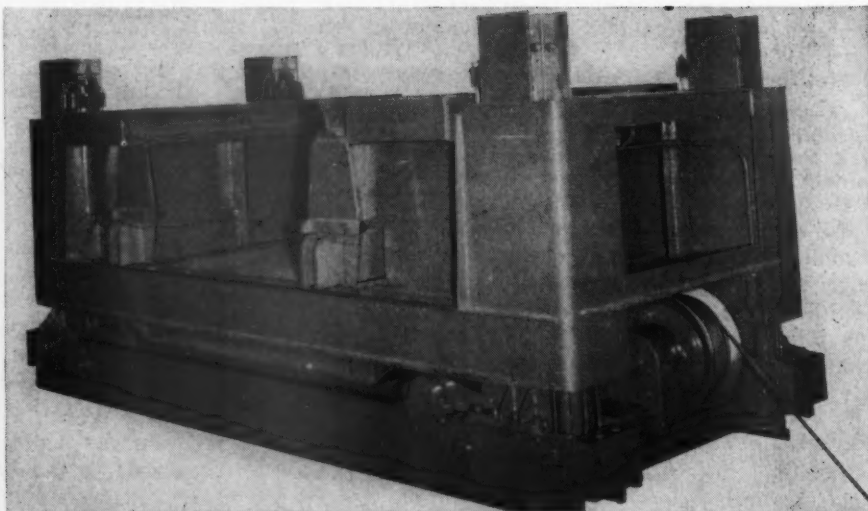


The Shaw-Box Type HH drop table installed at the Pennsylvania's engine-house at Grand Rapids, Mich.

It is available in capacities of 65 tons for handling four-wheel Diesel trucks and 100 tons for six-wheel trucks. The Type HC is the small table with capacities up to 50 tons for removing one pair of wheels from freight or passenger cars. Requiring only a narrow shallow pit, it can be installed in many existing pits.

All three tables have flow equalizers which divide the flow from the common pressure line and synchronize the movement of all cylinders to keep the table level constant regardless of the distribution of load on the table. The equalizers consist of a series of gear pumps driven by a common shaft and rotated by the flow from the pressure lines. The pumps, operated in individual chambers, deliver identical volumes of oil to each cylinder. Between each gear pump and its discharge port is a balancing valve which transmits the highest pressure to any port to all the gear pumps.

A feature of the Type HH table is a two-speed lift, attained by two sets of cylinders in each corner. One set raises

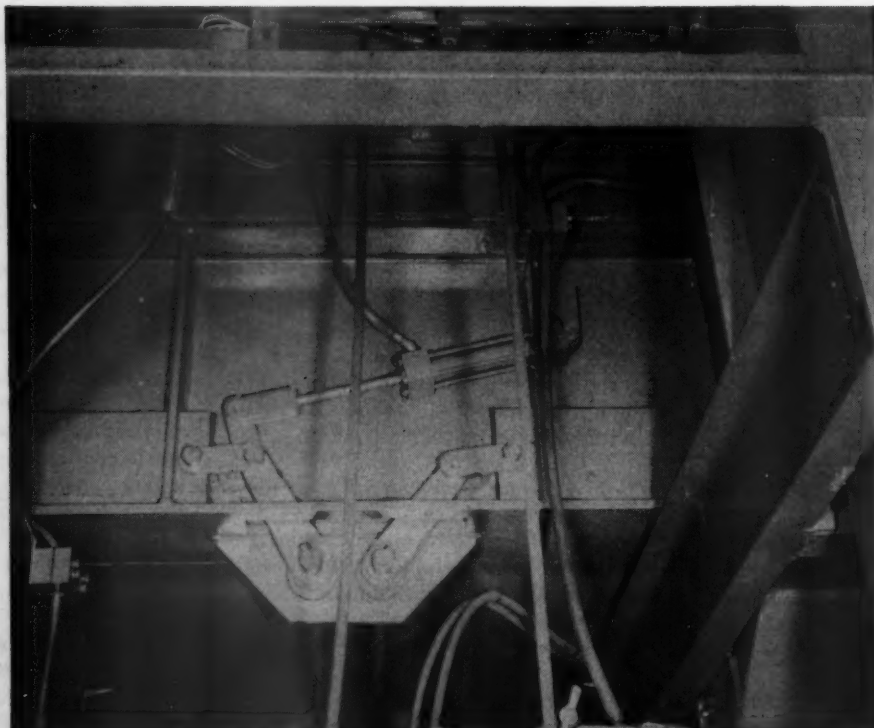


The hydraulic drop table with the top in the lowest position

and lowers the table elevator and lifting beams at high speed and the second set makes the final few inches of lift at low speed. The changeover between the two speeds is automatic. When the elevator reaches its high position the lifting bars are extended to provide seats for the heavy lift cylinders to thrust against for the final lift.

The traveling speed for this model is

from zero to 50 ft. per min. with infinite speed control, and the traveling circuit is interlocked with the hoisting circuit so that travel is only possible when the table is in the low position. All motions are controlled by push buttons connected to the table by a flexible conductor. Track switches and signal lights indicate when the table is properly aligned with the surface track openings.

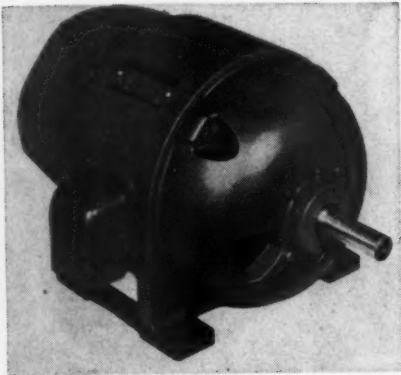


Hydraulically operated latch mechanism, controlled by a throttle to eliminate manual effort, locks the table in the raised position

Single-Phase Motor

For use where a constant-speed high-torque single-phase motor is required in large ratings, a new repulsion-induction motor has been announced by General Electric's Small and Medium Motor Divisions. An addition to the company's Tri-Clad line, the new motor combines the high starting torque of the repulsion motor with the constant-speed characteristics of the induction motor.

Designated as type SCR, the motor is available in 5-, 7½-, and 10-hp. ratings,



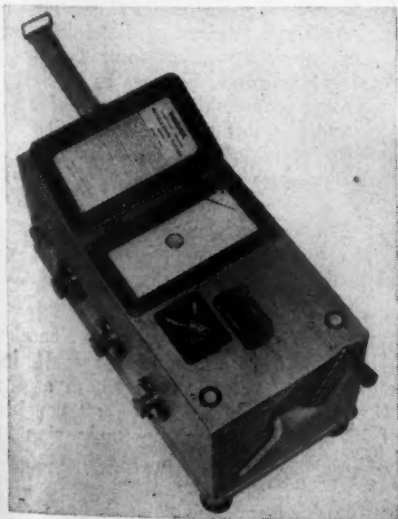
all 1,800 r.p.m. The 5-hp. unit operates on 115/230 volts, while the other two use 230 volts.

The motor is of the open (drip-proof) type. The cast-iron frame has a damping effect on noise and vibration, and covers are easily removed to facilitate inspection and maintenance of brushes.

To assure good alignment between stator and rotor, the ball bearings are mounted directly in the end shields of the new motor. Improved brush holders give good brush stability, and brushes and rigging are easily serviced. Efficient cooling is provided by a single large-diameter cast-aluminum fan.

High-Range Insulation Tester

The higher and wider ranges now available in Megger Insulation testers may be used in several kinds of field tests, par-



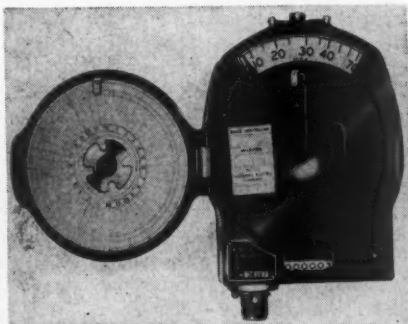
ticularly in testing circuit breaker bushings, and in making time-resistance (dielectric absorption) tests on apparatus which has relatively high 10-minute insulation resistance values. The instruments are produced by the James G. Biddle Company, Philadelphia, Pa.

The extremely wide range of the new instruments is accomplished by two overlapping scales which results in an 8½-in. scale length, as against 3½-in. in the old instruments. A simple switch selects between one scale or the other without the use of a multiplier or divider.

This new high range Megger instrument gives the maintenance engineer a simple, relatively inexpensive tool for detecting the deterioration in bushings. In the cases of some generators, transformers and cables with relatively high 1-minute insulation resistance values, which may increase with time during time-resistance tests, the instrument range should be high enough to permit this increase of resistance with time to be accurately observed.

Recorder for Switch Locomotives

A switch engine recorder distributed by the Barco Manufacturing Company, Chicago 40, has a chart which serves as a permanent graphic record, an illuminated speedometer, a clock and a mileage indicator, all visible to the engineman and automatically operated. It records four things, — locomotive speed in miles per hour, distance traveled, time the locomotive is in motion and time the locomotive is idle. The recorder is adaptable to all types of switching locomotives, both



steam and Diesel, and can readily be applied to any locomotive without major alterations.

The hinged door of the recorder contains a hand-wound clock with a 30-hour movement specially designed to withstand engine vibration. This door, when unlocked, gives access to the chart and permits winding and setting the clock. The mileage indicator reading is entered on the chart at the start of the trip. The chart is then slipped under the time pointer and clamped with the chart spring. Opening and closing the door cuts the edge of the chart, marking the beginning and end of the trip.

The chart, made of red paper, is coated with a white opaque wax and imprinted with appropriate lines. Both the dial and chart are calibrated from 0 to 70 m.p.h.

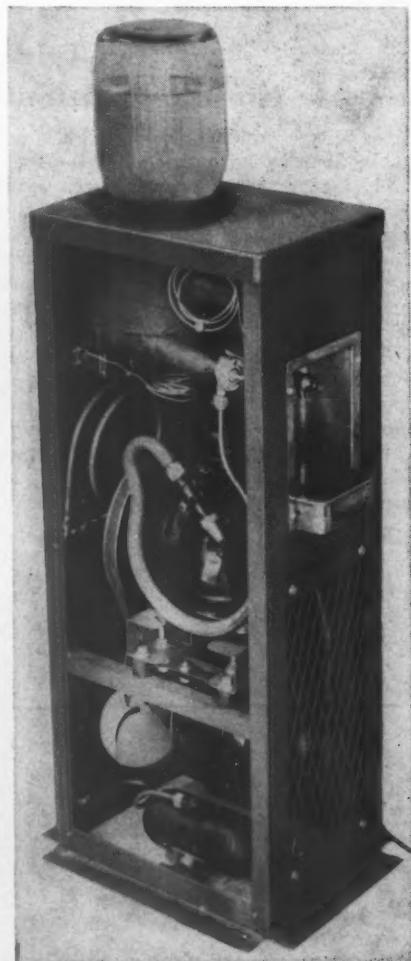
The chart, revolved by the clock, is held against three styli. One stylus records the speed, a second the distance traveled, and a third shows whether the locomotive is moving or standing.

The driving mechanism is available in both friction drive and axle drive models. The friction drive is recommended where it can be applied without interference. It consists of a drive wheel mounted in a casting connected to a plate by a hinged arm.

Diesel Locomotive Water Cooler

A packaged drinking water cooler, designed specifically for Diesel locomotive cab installation has been announced by the E. A. Lundy Company, Inc., New York. It bears the model number WC-640 and is designed to meet the needs of the railroads for an automatic electric water cooler, small and compact enough to be installed in the confined area of a Diesel cab. It weighs 122 lb. and measures 32½ in. x 10 in. x 13¾ in.

The cooler is self-contained with a 1-gal. water supply bottle and requires only connection to electrical outlet. Equipped with a heavy-duty air-cooled condensing unit, using Freon-12, the cooler is enclosed in a sturdily-constructed steel cabinet with removable panels offering ready access to all parts. A stainless steel alcove with push-button faucet is recessed in the front panel. Built-in control incorporates an off-



on switch, thermostat control, and motor overload protector. All metallic surfaces in contact with water are made of stainless steel to meet rigid sanitary specifications. Units are available for any voltage power source.

Impregnated Dry Lubrication

Processes that produce a solid film or dry lubricant impregnated into the surfaces of metals, plastics, rubber and ceramics in order to reduce friction and wear are now offered by the Metal Finishing Div., Pyrene Manufacturing Co., Newark 5, N. J. These processes have proved their value for reducing wear in internal combustion engines and other moving parts. They are in use in disc clutches, brakes, gears, worms and splines to reduce erosion and inhibit corrosion.

It is claimed that the desirable characteristics of graphite are retained, throughout wide ranges in temperature, in a permanent film that is unaffected by exposure to solvents or weather. In all cases, the processes must be adapted to specific engineering problems, but installation is simple and inexpensive.

Electrofilm Graphite Processes, as they are known, were invented by the Electrofilm Corp. of California. Along the eastern seaboard from Maine to Virginia they will be supervised through Pyrene's Metal Finishing Division. They will be available either on job work handled in the Pyrene plant or, if volume warrants, on a licensing basis.

Gap Table Grinding Machine

A centertype grinding machine with a gap table, for grinding locomotive piston rods, and similar parts requiring additional swing for a large diameter of short length, has been announced by Cincinnati Grinders Inc., Cincinnati 9, Ohio. These units have a nominal 16 in. swing, 40 in. over gap and are built in four lengths of 96, 120, 144 and 168 in.

The grinding wheel spindle runs on Filmatic bearings which develops high pressure wedge-shaped oil films between the segments and spindle diameter. Lubrication is automatic with circulating filtered oil. Should the lubricating system fail, the grinding wheel drive motor automatically stops.



The table is traversed by means of a rack and pinion gear and a simple drive from the motor. Traverse rates are variable from 3 to 120 in. per min., through a d.c. motor, electronically controlled from an a.c. source.

The electrical system for these units pro-



vides automatic acceleration and deceleration of the table at reversal, thereby eliminating shock. No mechanical clutches are employed. Tarry at each end of the table stroke can be independently adjusted for a time delay of zero to about 18 seconds.

Headstock for the unit is a dead spindle, d.c. motor driven unit, having a No. 15 Brown & Sharpe taper hole in the spindle. The unit has a long bearing on the table, approximately equal to the entire length of the headstock casting. Spindle speeds are rheostat controlled and are variable from 20 to 72 r.p.m.

All operating controls are within convenient and comfortable reach of the operator. Electrical control buttons and rheostats are grouped in a panel plainly labeled for quick reference, near the operator's right hand. A 20 hp. motor drives the grinding wheel spindle through matched V-belts; 2 hp. for the headstock and 1½ hp. for the table drive.

The net weight of the machine, completely equipped, approximates 32,800 lb. for the 96 in. length to 42,600 lb. for the 168 in. length.

Metal and Argon Arc Welder

The illustrated unit has been designed for automatic welding of aluminum by the argon shielded metal arc welding process.

The welder uses an arc maintained in a shield of argon gas between the consumable filler-metal electrode and the work-piece. The electrode, supplied as a coil of wire, is deposited across the arc into the weld as filler material or metal. The equipment for mechanized welding is known as the model FSM-1 and is applicable to either machine or hand welding.

Welds are clean and smooth; no flux is used and the possibility of flux corrosion or entrapment is eliminated. The aluminum alloys, welded commercially by this process presently includes 2S, 3S, 52-S and 61-S in plates ¼ to 1½ in. thick. Almost any thickness can be welded by a suitable number of passes. With the unit, now available from The Oxweld Railroad Service Co., Unit of Carbide and Carbon Corp., Chicago 1, Ill., butt-welding is performed in the flat position, and fillet and lap welding in the flat and horizontal positions.

This equipment and process can be used for the repair of aluminum Diesel pistons, the repair and fabrication of stainless steel dining car facilities, including floors, the repair of aluminum castings such as gear case covers, manifolds, etc., repair of stainless steel water tanks, fabrication of Everdur parts, railroad tank cars, storage tanks, pressure vessels, etc.

Square-Drive Socket Wrench Set

Snap-on Tools Corporation, Kenosha, Wisconsin, has announced a new ½ in. square-drive socket wrench known as the "Master Supreme Set." The set consists of 15 double hexagon sockets ranging in size from ⅞ in. to 1¼ in., a 10-in. ratchet, an 18-in. nut spinner, a 15-in. sliding bar, an 18¼-in. speeder, a universal joint and

Compare piston prices, for example:

<u>EMD</u>	<u>LOCO. "A"</u>	<u>LOCO. "B"</u>	<u>LOCO. "C"</u>
\$34.00	\$180.00	\$250.00	\$69.30

And remember, one piston fits *all* General Motors 567 Diesel engines—6, 8, 12 or 16 cylinders—in freight, passenger or switching service.

Lower parts inventory and lower cost parts are further reasons why more and more railroads are adding to their fleets of General Motors locomotives.



ELECTRO-MOTIVE DIVISION

General Motors, La Grange, Illinois

Home of the Diesel Locomotive

3½-, 5- and 10-in. extension bars.

The sockets feature a lock-groove in each of the four sides of the drive hole to grip the friction ball on the square drive of the handle for convenience and speed when interchanging units. Wrench openings are hot-broached to give clean, strong side walls, and the broaching chips are curled in at the bottom to present smooth, easy-to-clean interiors and to eliminate ragged broach chips which could thread onto a bolt. Socket exteriors are smooth without cross knurling. Large numbers and sizes are stamped on each socket.

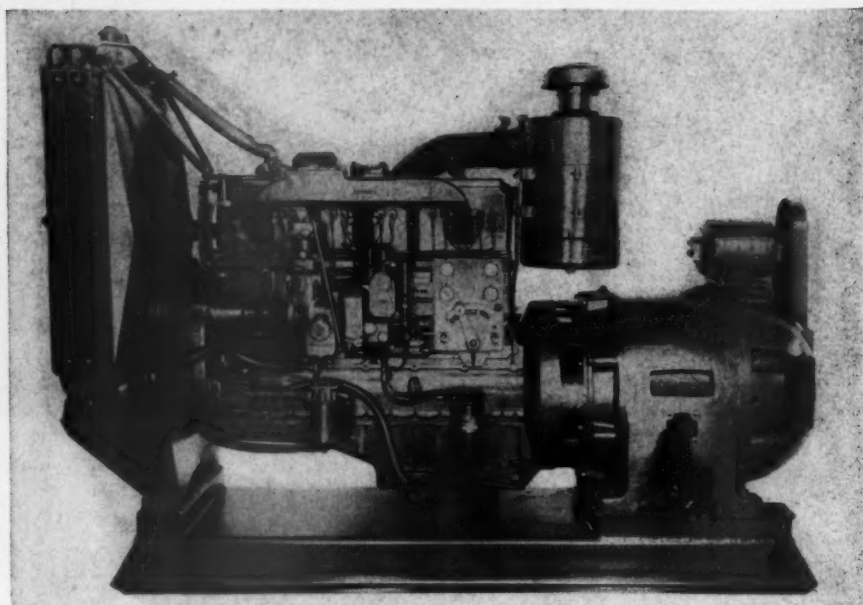
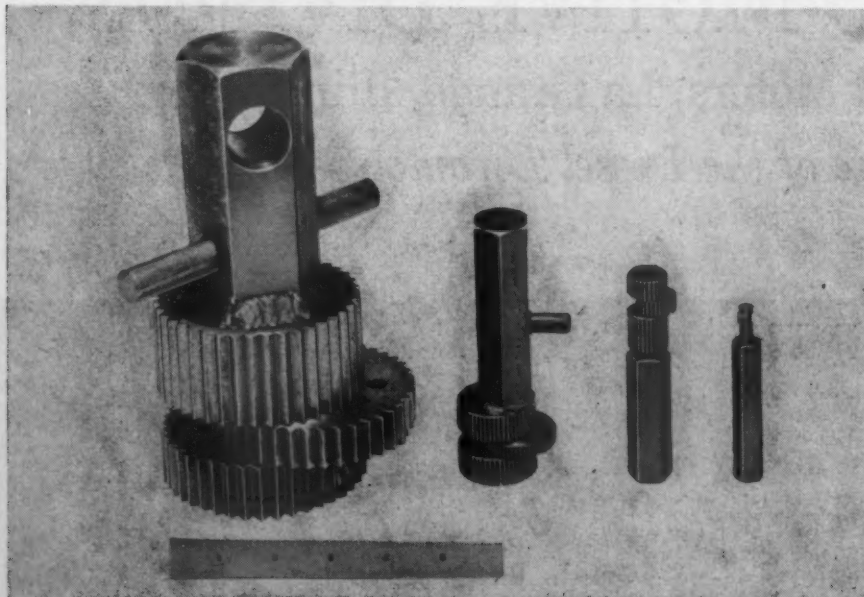
The handles incorporate Snap-on's new-style "Palm-Grip" which conforms to the shape of the hand. All handle units have a friction ball locking device held in place by a welch plug which is claimed to seat the ball and to reduce the amount of dirt and grit that enters to gum up the spring action.

The ratchet has a 32-tooth action, and only a 12-in. handle swing is necessary for operation in restricted areas. The new pawl is designed to engage two teeth of the gear at all times to furnish a smooth ratchet action and additional strength. All units in the set are heavily chrome plated for lasting appearance.

Internal Pipe Wrenches

Roddick Internal pipe wrenches are available in twelve standard pipe sizes from ⅜ in. to 4 in. Manufactured by the Roddick Tool Company, 112 Rochester street, Costa Mesa, Calif., these internal wrenches are equally efficient for fittings of pipe, electrical conduit or any type of tubing. They can be used for installing or extracting fittings in close quarters where conventional equipment cannot be used, and where the exterior cannot be marred or scratched.

Heat-treated alloy steel is used for the construction parts. The entire line of sizes is available for use with standard, extra-heavy, and double extra-heavy pipe. In all sizes there is only one moving part which operates on a cam principal.



Diesel-Electric Power Units

Production of a standard commercial line of Diesel-powered electric generator units is announced by Cummins Engine Company, Inc., Columbus, Ind. Sixty-cycle units are available in 40, 50, 60, 75, 100, 125, 200 and 250 kw. ratings.

The units are designed for continuous service applications where the unit is the primary source of power. Optional equipment for the various generator units includes automatic overspeed shut-down control; automatic high temperature and low lubricating oil pressure shut-down; complete marine-type or radiator-type cooling systems; hydraulic governor; water-cooled exhaust manifold, and generator mounted package control unit. Special generator voltages and kw. ratings are also available. The standard Diesel generator units are of alternating current type, 50-60 cycle, 3-phase, 3-wire, 3-phase 4-wire.

The unit consists of the engine, direct-connected to a single bearing generator,

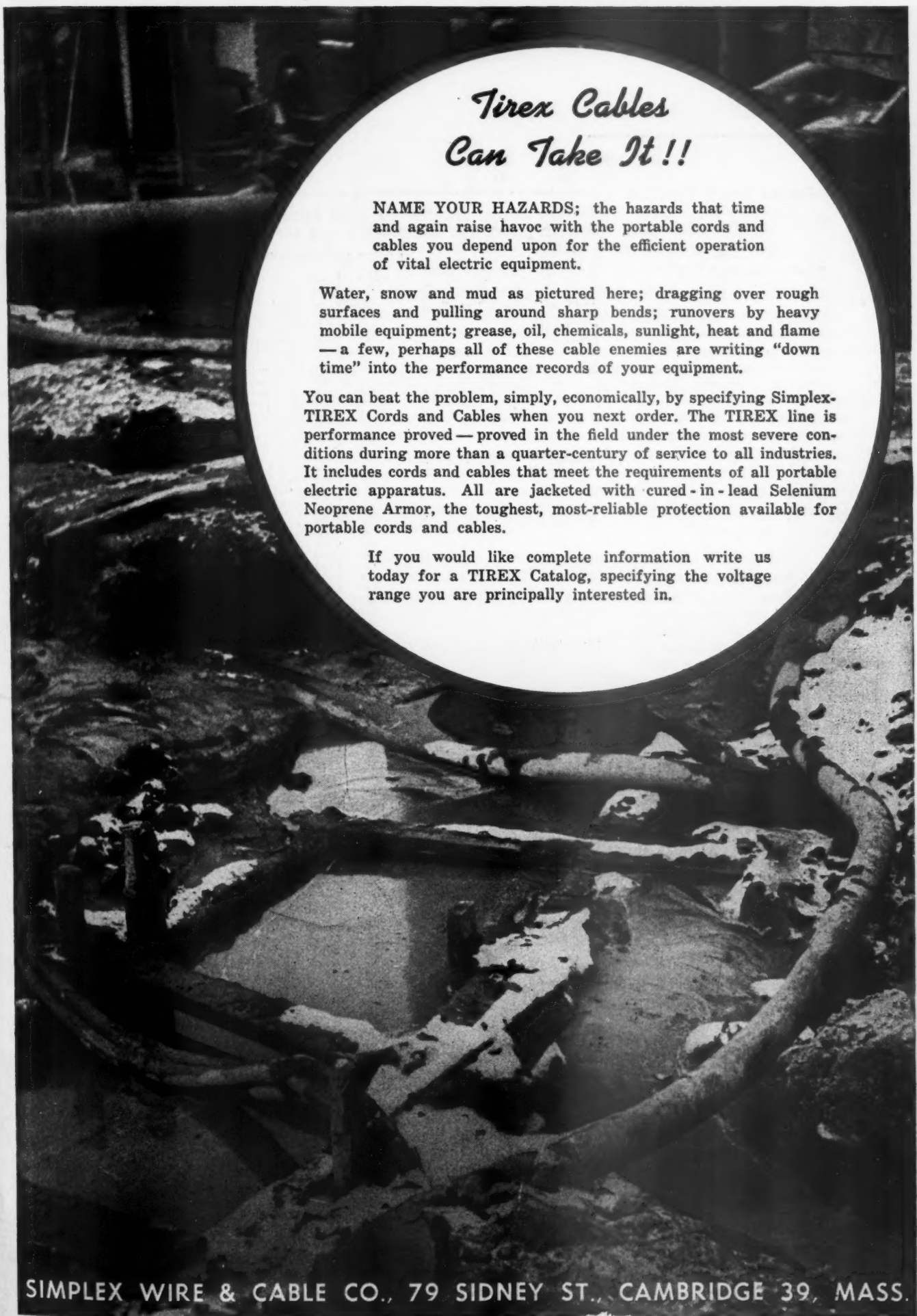
the engine and generator being mounted on a common structural steel-sub-base. All kilowatt ratings shown are for continuous duty operation. At full load of the generator, the engine delivers from 68 per cent to 76 per cent of the maximum horsepower available at that speed, depending upon the kilowatt size of the generator and the engine used.

Gasket for Air Brake Flanged Unions



Gustin-Bacon Manufacturing Company, 1412 West 12th street, Kansas City, Mo., has announced a gasket to prevent air leakage at flanged pipe unions in air brake equipment. With the new G-B Flex-tite gasket, which has been considered by the A.A.R. Committee on Brakes and Brake Equipment and has been approved by all members of that committee, no special fittings for threaded pipe connections inside flanged unions are required, and conventional flanged unions can still be used.

The new Flex-tite split sealing gasket
(Continued on page 609)

The background of the advertisement is a black and white photograph of a construction site. A large circular cutout is centered in the upper half of the image, containing text. The text is arranged in a hierarchy: a title, a paragraph about hazards, a paragraph about various environmental factors, a paragraph about the benefits of TIREX cables, and a final paragraph offering more information. The overall tone is industrial and emphasizes the durability of the product.

Tirex Cables Can Take It!!

NAME YOUR HAZARDS; the hazards that time and again raise havoc with the portable cords and cables you depend upon for the efficient operation of vital electric equipment.

Water, snow and mud as pictured here; dragging over rough surfaces and pulling around sharp bends; runovers by heavy mobile equipment; grease, oil, chemicals, sunlight, heat and flame — a few, perhaps all of these cable enemies are writing "down time" into the performance records of your equipment.

You can beat the problem, simply, economically, by specifying Simplex-TIREX Cords and Cables when you next order. The TIREX line is performance proved — proved in the field under the most severe conditions during more than a quarter-century of service to all industries. It includes cords and cables that meet the requirements of all portable electric apparatus. All are jacketed with cured-in-lead Selenium Neoprene Armor, the toughest, most-reliable protection available for portable cords and cables.

If you would like complete information write us today for a TIREX Catalog, specifying the voltage range you are principally interested in.

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

NEWS

Erie to Expand Diesel Facilities

PLANS for expenditure of approximately \$1½ million for expansion of the Erie's Diesel locomotive repair and maintenance facilities have been announced by R. C. Randall, vice-president, operations and maintenance.

About \$1 million will be spent at Marion, Ohio, to make it the largest Diesel maintenance point on the railroad. Actual construction work, expected to begin about December 1, calls for increasing the size of present Diesel shop buildings; additional engine pits, all with different levels to permit mechanics to work on any part of a locomotive without scaffolding; rearrangement of trackage in Marion yards to provide room for enlargement of buildings, and installation of modern lighting and heating equipment, traveling cranes and other materials handling facilities.

More than \$500,000 also will be spent at Hornell, N. Y., to make it the Erie's principal eastern Diesel locomotive repair and maintenance center. Work at Hornell, which is expected to begin about October 15, will include extensive revision in existing locomotive repair buildings; rearrangement of trackage into the shops; installation of pits with multiple working levels; relocation of water lines, drainage and sewer systems; construction of a water purifying plant, and expansion of locomotive fueling and sanding facilities.

By mid 1951, according to Mr. Randall, about 90 per cent of the Erie's freight service, 98 per cent of its switching service, all its through passenger service and 50 per cent of its New Jersey suburban passenger service will be Diesel-operated.

When the facilities now authorized are completed, Marion—which is the site of the Erie's principal east-west freight classification yard—will serve as headquarters for most of the Diesel units assigned to freight service on the road's Western district. Hornell will become the road's principal eastern Diesel repair and maintenance center and the main point for servicing its Electro-Motive Diesels and the new two-unit, 4,500-hp. locomotives recently ordered for through passenger trains. Three-unit locomotives now assigned to those trains will be transferred to freight service. Remaining steam locomotives will continue to be overhauled at Hornell.

Fuel from Oil Shale Runs D. & R.G.W. "Prospector"

DIESEL fuel derived from oil shale was used to power the Denver & Rio Grande Westerns streamlined "Prospector" between Salt Lake City, Utah, and Denver, Colo., on a special demonstration run September 1. The fuel came from the

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE SEPTEMBER ISSUE

DIESEL-LOCOMOTIVE ORDERS

Road	No. of units	Horse-power	Service	Builder
Atchison, Topeka & Santa Fe.....	10	1,600	Road switch.....	Fairbanks, Morse
	10		Passenger.....	Electro-Motive
Clinchfield.....	12	1,500	General purpose.....	Electro-Motive
Erie.....	14 ¹	2,250	Passenger.....	Electro-Motive
	3 ¹	1,500	Road freight.....	Electro-Motive
	4 ¹	1,500	Road switch.....	Electro-Motive
	1 ¹	1,000	Yard switch.....	Electro-Motive
	2 ¹	1,000	Yard switch.....	Baldwin
	6 ¹	1,500	Road switch.....	Baldwin
	8 ¹	1,500	Road freight.....	Alco-G. E.
	2 ¹	2,250	Passenger.....	Alco-G. E.
	6 ¹	1,500	Passenger.....	Alco-G. E.
	10 ¹	1,500	Road switch.....	Alco-G. E.
	1 ¹	1,000	Yard switch.....	Alco-G. E.
Georgia.....	4	1,500	General purpose.....	Electro-Motive
Pennsylvania.....	13 ²	660	Switch.....	Alco-G. E.
	16 ²	1,000	Switch.....	Alco-G. E.
	22 ²	1,000	Road switch.....	Alco-G. E.
	15 ²	1,600	Road switch.....	Alco-G. E.
	18 ²	1,600	Freight.....	Alco-G. E.
	60 ²	1,600	Road.....	Baldwin
	6 ²	800	Switch.....	Baldwin
	19 ²	1,200	Switch.....	Baldwin
	9 ²	1,600	General purpose.....	Baldwin
	14 ²	2,400	Transfer.....	Baldwin
	18 ²	2,250	Passenger.....	Electro-Motive
	14 ²	1,200	Switch.....	Electro-Motive
	68A ³	1,500	Freight.....	Electro-Motive
	28B ³	1,500	Freight.....	Electro-Motive
	26 ³	2,000	Road switch.....	Fairbanks, Morse
	11 ³	2,400	Transfer.....	Lima-Hamilton
Union Pacific.....	3 ⁴	1,600	All-purpose.....	Fairbanks, Morse

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Ann Arbor.....	100	50-ton box.....	American Car & Fdry
Atlantic Coast Line.....	400	70-ton covered phosphate.....	American Car & Fdry.
Baltimore & Ohio ¹	1,000	70-ton gondola.....	Bethlehem Steel
	200	50-ton automobile.....	American Car & Fdry.
Central Vermont.....	2	50-ton air dump.....	Magor Car
Chicago & Eastern Illinois.....	200 ²	Box.....	Pullman-Standard
	200 ²	Box.....	American Car & Fdry.
	100 ²	Box.....	Company shops
	200	Gondola.....	Company shops
Chicago, Rock Island & Pacific.....	500	Flat.....	Company shops
	350	50-ton box.....	General American
Delaware, Lackawanna & Western..	500	70-ton gondola.....	American Car & Fdry.
Detroit & Toledo Shore.....	100	70-ton covered hopper.....	Greenville Steel Car
Erie.....	5 ⁴	125-ton flat.....	Company shops
	100 ⁴	70-ton flat.....	Company shops
Fruit Growers Express.....	1,000	40-ton refrigerator.....	Pacific Car & Fdry.
	100	50-ton refrigerator.....	Company shops
Illinois Central.....	1,000 ⁷	Box.....	Company shops
Lehigh Valley.....	200 ⁸	70-ton gondola.....	Bethlehem Steel
New Jersey, Indiana & Illinois.....	100	Box.....	American Car & Fdry
Missouri Pacific.....	300 ⁹	70-ton gondola.....	Company shops
	250 ⁹	50-ton box.....	Company shops
	200 ⁹	70-ton covered hopper.....	Company shops
	50 ⁹	50-ton pulpwood.....	Company shops
Montour.....	300 ¹⁰	50-ton hopper.....	Greenville Steel Car
Norfolk & Western.....	1,000	70-ton hopper.....	Company shops
Northern Pacific.....	500 ¹¹	50-ton box.....	Company shops
Pacific Fruit Express.....	2,100 ¹²	Refrigerator.....	Company shops
Reading.....	500 ¹³	70-ton gondola.....	Bethlehem Steel
St. Louis-San Francisco.....	100	50-ton flat.....	American Car & Fdry.
Spokane International.....	75	Flat.....	American Car & Fdry.
Wabash.....	500 ¹⁴	50-ton box.....	Company shops
Western Fruit Express.....	400 ¹⁵	Refrigerator.....	Company shops
Western Maryland.....	410 ¹⁶	70-ton gondola.....	Bethlehem Steel
	40 ¹⁶	70-ton flat.....	Company shops
	100 ¹⁶	70-ton covered hopper.....	American Car & Fdry.
	100 ¹⁶	50-ton box.....	Greenville Steel Car
	50 ¹⁶	50-ton box.....	Pressed Steel Car

FREIGHT-CAR INQUIRIES

Norfolk & Western.....	500	50-ton box.....
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PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Baltimore & Ohio.....	21 ⁷	Rail Diesel (RDC-1).....	Budd Co.
Great Northern.....	4	Baggage-express.....	Company shops

¹ This authorization supplements an earlier 1950 Erie order for 62 Diesel units, previously reported. Except for two yard switchers, all the locomotives will be fully equipped with radio telephone. Delivery of the units now authorized will bring the road to about 95 per cent complete Dieselization, according to Paul W. Johnston, Erie president. Except for New Jersey suburban service, about half of which will be Diesel-operated, passenger service will be fully Dieselized.

² Walter S. Franklin, president of the Pennsylvania, in announcing the new order, said that the decision.

A black and white photograph of a Baltimore and Ohio diesel locomotive on tracks. The locomotive is dark-colored with "BALTIMORE AND OHIO" written on its side. It is positioned on a set of tracks that curve to the left. In the background, there are buildings and trees. A large white rectangular overlay is placed over the upper right portion of the image, containing the main text.

Still More

FAIRBANKS-MORSE

HEAVY DUTY

OPPOSED-PISTON DIESEL

MOTIVE POWER

FOR THE

B&O

to acquire the additional Diesel-electric locomotives was the outgrowth of a thorough study of the road's present and future locomotive requirements. "On the Pennsylvania," he said, "there are many train operations now powered by steam locomotives, and in a number of instances the economies inherent in Dieselization, compared with steam power, are not sufficient to warrant the investment in Diesels. For this reason we intend to continue the use of steam power where it is economically justified."

¹ To cost \$420,000.

² The road has also ordered 300 underframes from the Greenville Steel Car Company for 70-ton flat cars to be built in B.&O. shops.

³ In addition to the 200 cars reported in the September issue.

⁴ The five 125-ton cars will be heavy-duty depressed center cars with six-wheel trucks. The 100 cars will be standard 70-ton type with four-wheel trucks.

⁵ In addition, one-hundred covered hopper cars will be ordered from commercial builders.

⁶ In addition to the 300 reported in the September issue.

⁷ The gondolas are to be divided (200 for the M.P. and 50 each for the Gulf Coast Lines and the International-Great Northern), and the covered hopper cars (100 for the M.P. and 50 each for the G.C.L. and the I.-GN.), and 50 50-ton pulpwood cars.

⁸ For delivery first quarter 1951.

⁹ Part of a \$24-million car-building program which the Northern Pacific has announced. Upon completion of this initial order, plans call for production of 50 steel cabooses, 100 covered hopper cars and 500 40-ft. box cars. In addition, 250 gondolas are to be purchased or built at the Brainerd shops. The 50-ft. box cars initially ordered will have 8-ft. doors designed to accommodate mechanical handling of lumber, plywood and similar types of freight. Production schedules call for 10 to 12 cars to be built each day; it is anticipated the entire initial box car order will be completed by the middle of October.

¹⁰ Included in this program are 100 heavily insulated 50-ft. cars for carrying frozen foods. The remaining 2,000 new cars will be similar to other cars the company has placed in service during the post-war period, except that they will be equipped with larger sliding doors and will have steel slatted, instead of wooden floor racks. The new cars will be built in P.F.E. shops at Los Angeles, Cal., and Colton, as soon as materials are available. It is expected the first cars will be in service before the middle of 1951. The program for 1950 calls also for general repairs to almost 4,000 cars.

¹¹ To cost approximately \$2,800,000.

¹² These are the box cars included in the company's car-construction program reported in the September issue.

¹³ To cost \$3,400,000. One hundred cars of the company's present fleet are to be rebuilt at a cost of \$474,000.

¹⁴ One hundred twenty steel containers have also been ordered for use in 10 of the gondola cars, have been ordered from the Youngstown Steel Door Company.

¹⁵ To be operated as a two-car train, replacing steam-powered commuter coach trains.

NOTES:

Atlantic Coast Line.—The Coast Line has purchased six lightweight coaches from the Budd Company and four lightweight 6 double bedroom-10 roomette sleeping cars from the Pullman-Standard Car Manufacturing Company. These cars were built on orders from the Chesapeake & Ohio subsequently taken over by the Coast Line. They are expected to be placed in service in the near future.

Great Northern.—The Great Northern has been authorized by its board of directors to acquire 250 new gondola cars at a cost of \$1,500,000. The road currently has on order 35 Diesel-electric locomotives, 100 passenger-train cars and 50 refrigerator cars.

Illinois Central.—The Illinois Central is currently taking delivery from the Pullman-Standard Car Manufacturing Company of eight lightweight 10-roomette, 6-double-bedroom sleeping cars, costing a total of \$1,200,000, which originally were part of a larger order placed by the Chesapeake & Ohio but transferred to the I.C. before the cars were actually built.

North Western Refrigerator Line Company.—This company has awarded to the Greenville Steel Car Company a contract for repairing 125 refrigerator cars.

Pennsylvania.—The Pennsylvania plans to spend approximately \$4,000,000 on modernization of 40 dining cars.

Southern Pacific.—The Southern Pacific has received authority from its board of directors to purchase or build 5,000 new freight cars. This latest addition to the road's equipment purchase program calls for 3,500 box cars, 1,100 gondolas, 250 covered hopper cars, 100 open hopper cars and 50 cabooses. The road has also received authority to purchase 46 Diesel-electric locomotives, including 21 branch-line units and 25 switchers.

U. S. Bureau of Mines experimental oil-shale plant near Rifle, Colo. The demonstration of shale Diesel fuel was arranged by the Rio Grande in co-operation with Boyd Guthrie, chief of the oil-shale demonstration branch to show the practicality of such fuel.

The "Prospector's" Diesel locomotive carried 3,750 gal. of Diesel fuel at the start of the trip. This fuel was refined from 624 tons of shale which also produced an equal amount of gasoline, 6,600 gal. of heavy fuel oil, nearly seven tons of coke and other miscellaneous by-products, according to Mr. Guthrie.

Labor Department Reports on Equipment Makers

Railroad locomotive and car building industries "are part of a group in durable goods manufacturing where overtime can be expanded substantially to meet any defense orders," the Bureau of Labor Statistics of the U. S. Department of Labor says in a recently issued report.

In support of this statement, the bureau points out that in June of this year employees in railway and street car building plants worked an average of only 38.7 hr. per week, and those in locomotive and locomotive parts plants only 39.5 hr., while in the same month all manufacturing employees worked an average of 40.5 hr. per week, and those in all durable goods industries 41.4 hr. On the other hand, employee earnings in the railroad equipment industries were considerably higher than employee earnings in manufacturing gen-

erally. Average hourly earnings in car plants, the bureau says, were \$1.576 and in locomotive plants \$1.719, against \$1.454 in all manufacturing. Average weekly earnings were \$60.99 in car plants; \$67.90 in locomotive plants, and \$58.89 in "all manufacturing."

MISCELLANEOUS PUBLICATIONS

RECOMMENDED PRACTICES FOR RESISTANCE WELDING—Published by American Welding Society, 33 West Thirty-Ninth Street, New York 18, 60 pages. Price, \$1. This edition represents a modification and expansion of the Standard originally issued in tentative form in 1946. Included are welding schedules for spot and seam welding mild and medium carbon steels, low-alloy steels, stainless steels, nickel, Inconel and magnesium alloys. Recommended practices for projection welding cover low-carbon and stainless steels. Flash welding data are provided for low and medium forging strength steels. The section on methods of testing resistance welds includes the new peel test and an expanded discussion of the control of resistance weld quality by statistical methods. Other methods of test for which the Standard specimen, method of testing and evaluation of results are given include the tension-shear test, cross and U-tension tests, shear and drop impact tests, fatigue test and twist test. The standard pillow test for seam welds is also described.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

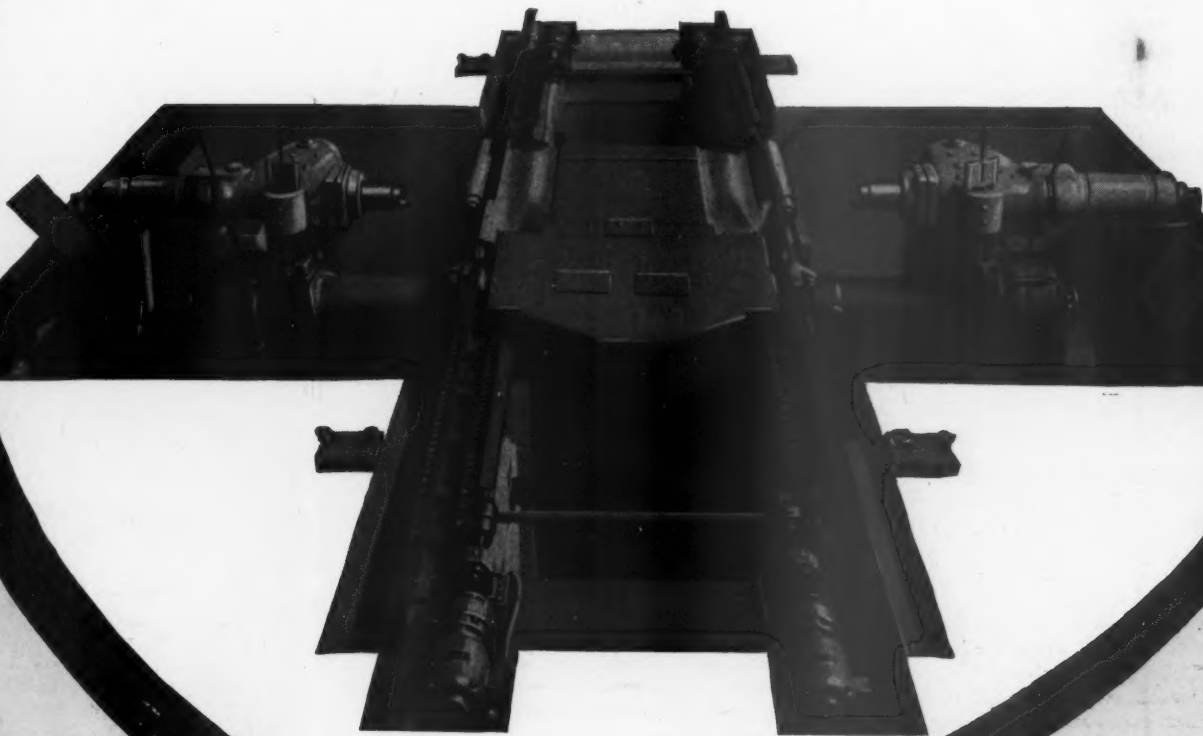
FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.	Month of May		Five months ended with May	
	1950	1949	1950	1949
3 Road locomotive miles (000) (M-211):				
3-05 Total, steam.....	29,145	35,216	136,221	178,535
3-06 Total, Diesel-electric.....	17,047	12,511	80,596	57,253
3-07 Total, electric.....	824	864	4,017	4,249
3-04 Total, locomotive-miles.....	47,020	48,591	220,857	240,038
4 Car-miles (000,000) (M-211):				
4-03 Loaded, total.....	1,612	1,578	7,402	7,524
4-06 Empty, total.....	864	949	4,039	4,363
6 Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01 Total in coal-burning steam locomotive trains.....	49,684	59,352	219,303	283,254
6-02 Total in oil-burning steam locomotive trains.....	12,516	15,652	55,883	74,771
6-03 Total in Diesel-electric locomotive trains.....	48,131	36,124	226,603	164,090
6-04 Total in electric locomotive trains.....	2,170	2,397	10,476	11,494
6-06 Total in all trains.....	112,524	113,532	512,369	533,638
10 Averages per train-mile (excluding light trains) (M-211):				
10-01 Locomotive-miles (principal and helper).....	1.05	1.06	1.05	1.06
10-02 Loaded freight car-miles.....	38.30	36.70	37.40	35.40
10-03 Empty freight car-miles.....	20.60	22.10	20.40	20.50
10-04 Total freight car-miles (excluding cabooses).....	58.90	58.80	57.80	55.90
10-05 Gross ton-miles (excluding locomotive and tender).....	2,677	2,644	2,590	2,510
10-06 Net ton-miles.....	1,217	1,202	1,162	1,144
12 Net ton-mile per loaded car-mile (M-211).....	31.70	32.70	31.10	32.30
13 Car-mile ratios (M-211):				
13-03 Per cent loaded of total freight car-miles.....	65.10	62.40	64.70	63.30
14 Averages per train hour (M-211):				
14-01 Train miles.....	17.10	17.10	17.00	16.80
14-02 Gross ton-miles (excluding locomotive and tender).....	45,168	44,594	43,480	41,707
14 Car-miles per freight car day (M-240):				
14-01 Serviceable.....	44.70	44.10	42.50	42.50
14-02 All.....	41.70	41.80	39.50	40.40
15 Average net ton-miles per freight car-day (M-240).....	860	853	795	826
17 Per cent of home cars of total freight cars on the line (M-240).....	42.30	51.20	46.50	49.90

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3 Road motive-power miles (000):				
3-05 Steam.....	11,485	15,585	56,022	83,960
3-06 Diesel-electric.....	14,059	12,924	69,918	59,531
3-07 Electric.....	1,546	1,681	7,910	8,475
3-04 Total.....	27,090	30,206	133,850	152,959
4 Passenger-train car-miles (000):				
4-08 Total in all locomotive-propelled trains.....	252,756	278,957	1,281,534	1,401,693
4-09 Total in coal-burning steam locomotive trains.....	58,260	78,900	283,019	444,430
4-10 Total in oil-burning steam locomotive trains.....	33,692	42,867	171,838	218,385
4-11 Total in Diesel-electric locomotive trains.....	144,592	138,934	740,668	645,423
12 Total car-miles per train-mile.....	9.10	9.01	9.33	9.04

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SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS—(Continued)

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,415	1,886	6,945	10,026
1-02	Steam, oil-burning	234	278	1,108	1,476
1-03	Diesel-electric ¹	2,454	1,986	11,659	9,472
1-06	Total	4,130	4,176	19,843	21,108
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	56	91	307	509
2-02	Steam, oil-burning	12	15	64	83
2-03	Diesel-electric ¹	222	214	1,104	1,006
2-06	Total	324	355	1,644	1,772
3	Hours per yard locomotive-day:				
3-01	Steam	7.70	8.30	7.50	8.90
3-02	Diesel-electric	17.10	17.30	17.20	17.60
3-05	Serviceable	13.70	13.20	13.70	13.50
3-06	All locomotives (serviceable, unserviceable and stored)	11.50	11.20	11.40	11.50
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.77	1.83	1.85	1.93
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.80	0.79	0.80	0.78

¹ Excludes B and trailing A units.

SUPPLY TRADE NOTES

IRON & STEEL PRODUCTS, INC.—*W. E. Corr* of Norfolk, Va., is no longer associated with Iron & Steel Products, Inc.

NICKEL CADMIUM BATTERY CORPORATION.—*The Valley Bearing & Equipment Co.*, 1 North LaSalle street, Chicago 2, has been appointed sales representative for Nicad storage batteries.

NATIONAL LOCK WASHER COMPANY.—*Gilbert E. Webster*, whose election as president of the National Lock Washer Company, Newark, N. J., was announced in the September issue, was born in Odon, Ind., on November 23, 1900. In addition to public school he attended military school in Mexico, Mo. He began his business career in 1918 with the Illinois Central, working as a clerk, statistician and chief clerk on the Illinois division of this road



Gilbert E. Webster

until 1922. From 1923 to 1938, he was associated with the P. & M. Company as foundry sales representative and southwestern sales agent and, during part of this period, also was associated with the southwestern sales representative of National Lock Washer. In 1939 he was appointed manager of railway track spring washer sales of National Lock Washer and later was appointed general sales manager

and vice-president. Mr. Webster was vice-president and director at the time of his recent election.

GENERAL ELECTRIC COMPANY.—Large-scale production of gas turbines for land, railroad, and marine use has been started by the General Electric Company in Schenectady, N. Y., plant facilities now being equipped at a cost in excess of \$4,000,000.

"Technological advances during the last 12 years and successful operation of units now installed indicate the gas turbine is ready to assume a significant role in the power field, along with steam and mercury power plants," Glenn B. Warren, manager of the company's Turbine divisions, said. "Further advances will find the gas turbine an effective tool, when properly applied, for still further reducing the cost of power."

Gas turbines now scheduled for production, Mr. Warren said, will be in three basic models: A 3,500-kw (4,800-hp.) simple-cycle type, similar to three units now operating—one for a Southwestern utility company, one for a New England power company, and the other in a gas turbine-electric locomotive;

A 5,000-kw. two-shaft compound-cycle type for power generation use; and

A newly designed 5,000hp. two-shaft mechanical-drive type for gas pipeline pumping and other applications.

Other sizes and types will be put into production as the gas turbine program develops, Mr. Warren added, emphasizing that "future applications are many and varied." Because of its compactness and quick-starting ability, the simple-cycle unit is well suited, he pointed out, for locomotive and marine use as well as for mounting on a railway car or motor truck for portable emergency power generation use.

One such unit, buning bunker "C" oil, is installed in an Alco G.E. locomotive. Although in the developmental stages and still under test, the locomotive is being used alongside other forms of motive power in regular freight service by the Union Pacific.

GOULD-NATIONAL BATTERIES, INC.—The National Battery Company will operate under the new name of Gould-National Batteries, Inc., which change evolves from the purchase of the Gould Storage Battery Company. Policies, management and operation of Gould-National Batteries, Inc., will remain the same as those followed heretofore by Gould and by National. The same sales and field engineering organizations, which have been serving under the name of the Gould Storage Battery Corporation, will now operate under the new name, with headquarters as before at Trenton, N. J. *M. W. Heinritz*, formerly vice-president of Gould Battery, has been elected vice-president in charge of industrial sales of Gould-National Batteries.

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY.—*W. B. Barnard* has been appointed sales and service engineer for Minneapolis-Honeywell transportation controls. Mr. Barnard, who will serve trans-



W. B. Barnard

portation accounts in the southeastern states, with headquarters at Richmond, Va., was formerly field engineer in the Chicago office for the company's western railroad accounts.

AMERICAN BRAKE SHOE COMPANY.—*Maurice N. Trainer*, first-vice-president of American Brake Shoe, has been elected president of the company.

AMERICAN CAR & FOUNDRY CO.—*John C. Coonley* has been appointed manager of the valve division of A. C. F., with headquarters as before at Detroit, Mich., succeeding *W. R. Kottsieper*, who has retired after more than 44 years of service.

Mr. Coonley was associated with the Walworth Company as salesman, engineer and tool design superintendent for many years before joining A. C. F. in June of this year, as assistant manager of the valve division.

KOPPERS COMPANY.—*Dr. E. W. Volkmann* and *Dr. F. L. Jones* have been appointed assistant managers of the research department of the Koppers Company. Dr. Volkmann will be responsible for the laboratory and development sections of the department, while Dr. Jones will supervise the



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Rods	20 minutes	Valves	15 minutes
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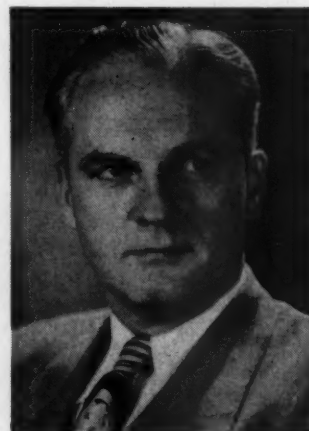
research administration and patents sections.

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—*Ronald K. Evans*, vice-president and group executive in charge of the general engine divisions of General Motors Corporation, has been elected an executive vice-president and



C. R. Osborn

Cyrus R. Osborn, vice-president of General Motors and general manager of its Electro-Motive Division, has been appointed to succeed Mr. Evans as group executive in



B. A. Dollens

charge of the engine group. *B. A. Dollens*, assistant general manager of Electro-Motive, has been appointed general manager, succeeding Mr. Osborn.

FAIRBANKS, MORSE & CO.—*J. G. Graham*, who for the past several years has been with the Railroad Locomotive Division of Fairbanks, Morse with headquarters in Chicago, has been appointed eastern regional manager of locomotive sales. Mr. Graham will be located in New York, where he will have jurisdiction over the sales of locomotives in the New York, Southeastern and Cleveland areas. *D. C. Prescott*, for the past year a representative of the locomotive sales staff in the Chicago district, has been appointed district manager-locomotive sales of the Southwestern district, with headquarters in St. Louis, Mo. *C. H. Morse, Jr.*,

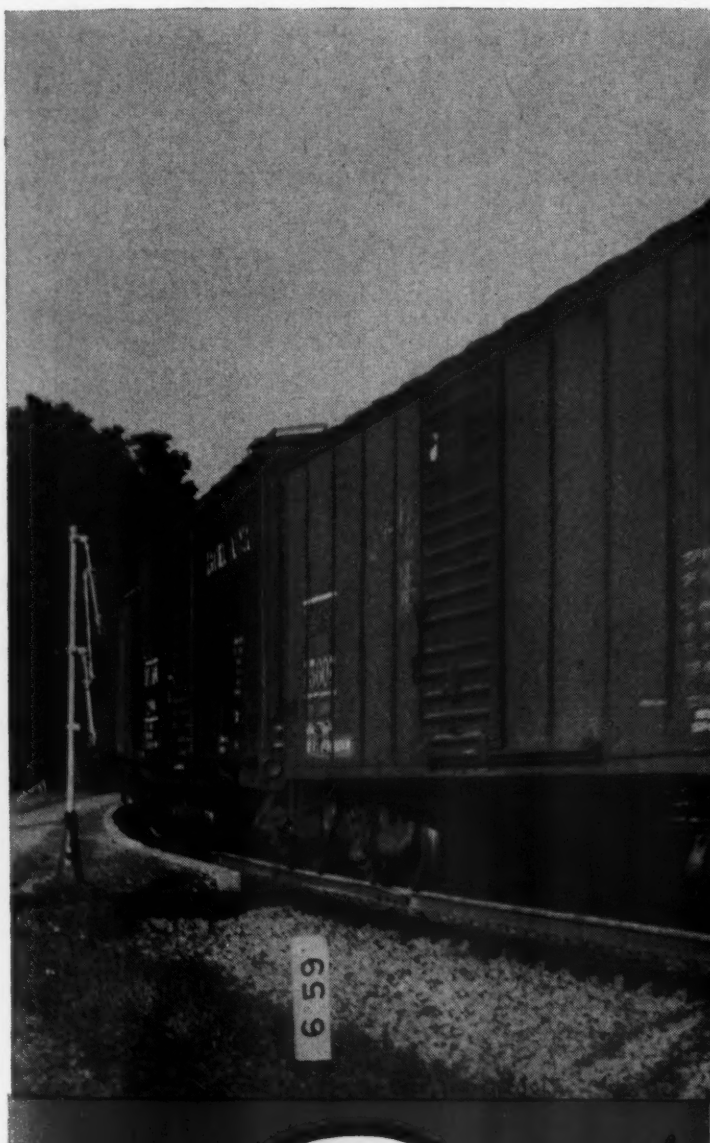
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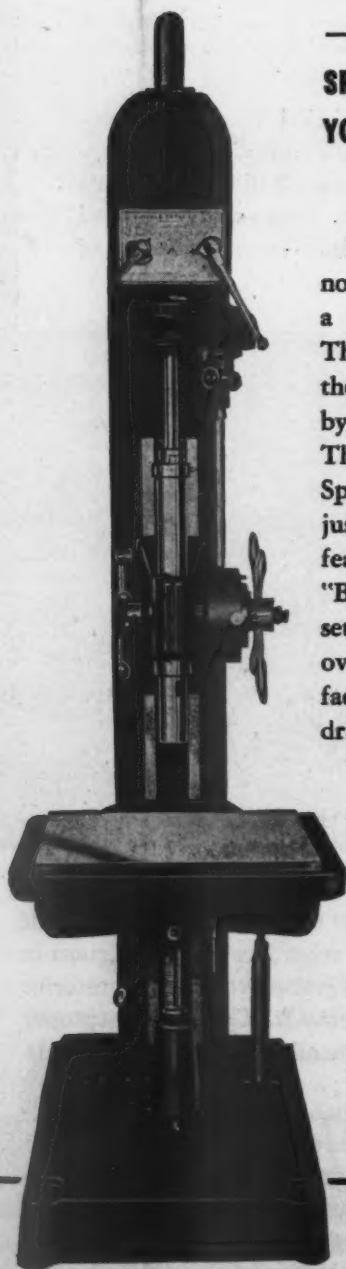
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for the past year assistant manager of Diesel locomotive service at Beloit, Wisc., has been appointed district manager-locomotive sales, with headquarters in Chicago. He will have sales jurisdiction over the Chicago and St. Paul-Minneapolis areas.

NATIONAL TUBE COMPANY.—*William F. McConnor* has been elected executive vice-president of the National Tube Company, subsidiary of the United States Steel Corporation, and *H. J. Wallace* has been elected sales vice-president, succeeding Mr. McConnor. *William J. McKee*, formerly sales manager, Central area, has been appointed general manager of sales, and *Louis W. Mason*, formerly assistant to general manager of sales, succeeds Mr. McKee as sales manager, Central area.

Mr. McConnor joined National Tube in 1917 and served in various engineering and operating positions, including that of as-



William F. McConnor

sistant to vice-president of operations, before transferring to the sales department. He was general manager of sales for 10 years before his appointment as sales vice-president in 1946.

Mr. Wallace joined a National Tube training course at the Lorain, Ohio, plant in 1929 and later worked as field engineer



H. J. Wallace

in the Pittsburgh, Pa., sales division until 1933. He subsequently worked in a sales capacity at Indianapolis, Ind., and Pittsburgh until 1937, when he was appointed manager of sales of the Pittsburgh district



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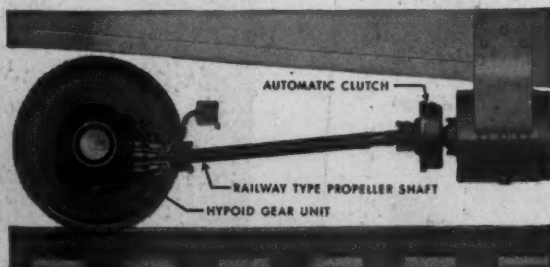
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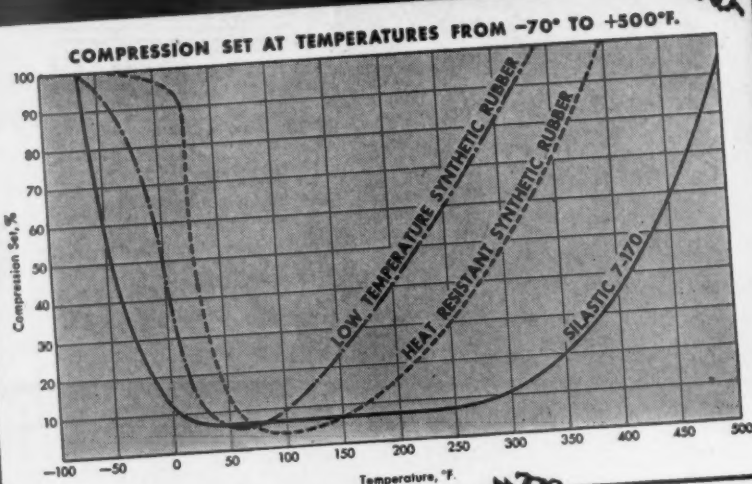
During the winter season, it always is wise to make Pullman and coach reservations (both going and returning) as far in advance as possible. You also have a better opportunity of obtaining the kind of space you desire if you (1) give alternate dates, (2) a choice of accommodations and (3) travel in the middle of the week. For information and reservations consult your local Ticket Agent or the nearest Atlantic Coast Line Ticket Office, New York Office: 16 East 64th Street, New York 17. Phone: MUrray Hill 2-0800. R. C. NEELAND, Assistant Passenger Traffic Manager.

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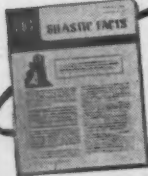
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office. He has been general manager of sales since 1946.

Mr. McKee began his career with National Tube in 1912. He held a number of positions in the operating and engineering departments and in 1929 was appointed assistant superintendent of field engineering and inspection. In 1931 he was appointed manager of the Tulsa, Okla., sales office and later worked as sales manager in New York. He was subsequently transferred to the general sales office at Pitts-



William J. McKee

burgh and in February, 1945, was appointed sales manager, Central area, at Chicago.

Mr. Mason began his career with the Carnegie-Illinois Steel Corporation, also a U. S. Steel subsidiary. He joined National Tube in 1923 as a buyer in the purchasing department and was appointed assistant purchasing agent in 1930. When



Louis W. Mason

the Tubular Alloy Steel Corporation, now National Tube's Gary, Ind., works, was founded, he was the first manager of purchases. He joined the sales department as assistant general manager of sales-ordnance at Washington, D. C., in 1944, and following World War II, worked in Detroit, Mich., and Pittsburgh, as manager of sales. He was appointed assistant to general manager of sales at Pittsburgh in 1948.

JOHN F. CORCORAN, former assistant to the president of the American Locomotive Company, at Chicago, has entered the rail-

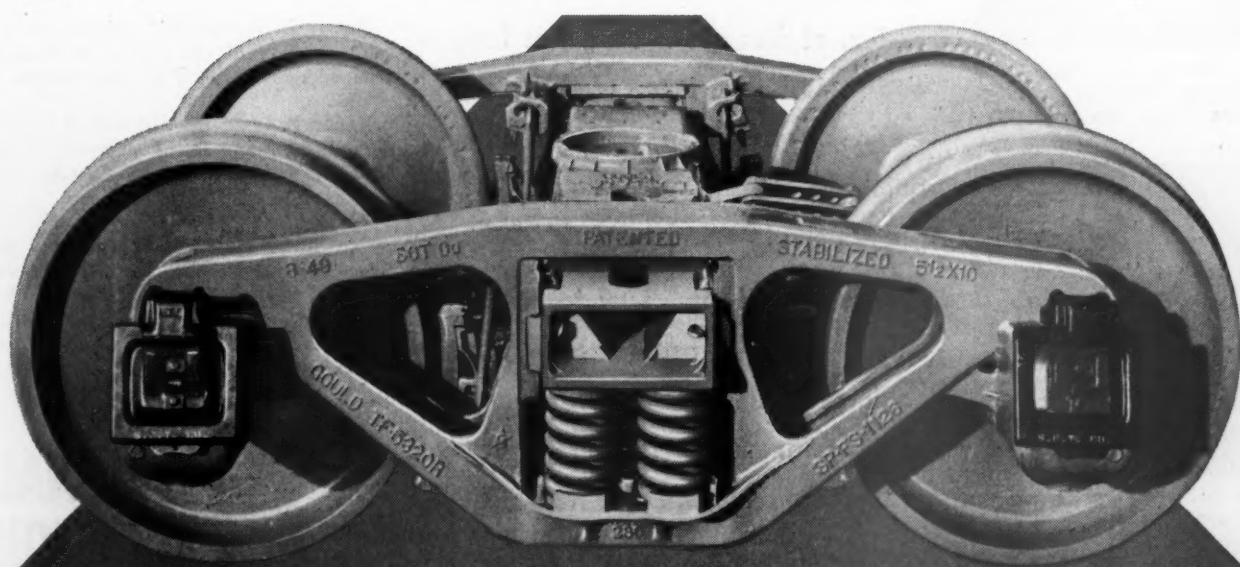
OCTOBER, 1950

"Easy AS FALLING OFF A LOG"

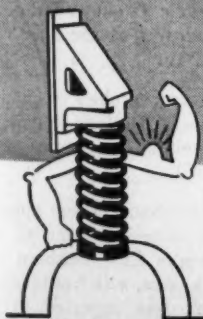


Barber Stabilized Trucks are "load actuated". Release the load on the truck, pull the pins, and all the working parts are completely free and clear of the Bolster—which makes removal easy without use of bars or other tools.

In other words, *Barber Stabilized Trucks* are as easy to dis-assemble or re-assemble as former *A. A. R.* type trucks. Fine lateral as well as vertical control is obtained with Barber Stabilized Trucks having spring deflections up to $3\frac{1}{16}$ ".



Over 240,000 Car Sets of
Barber Stabilized Trucks have been ordered

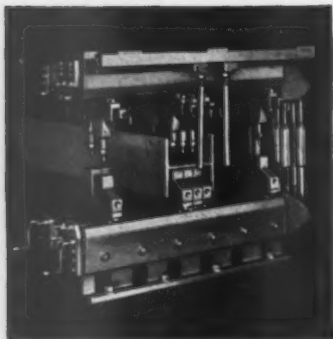


The side springs increase the capacity of the Barber Truck since they carry their share of the load.

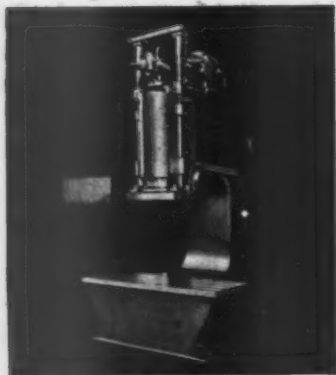
5278

STANDARD CAR TRUCK COMPANY

332 SOUTH MICHIGAN AVENUE, CHICAGO, ILLINOIS



BEATTY Adjustable Tools punch webs of beams and channels, legs of angles and plates.



BEATTY 250-Ton Gap Type Press for forming, bending, flanging, pressing.



BEATTY Guillotine Bar Shear for "short order" shearing without changing tools.



BEATTY Horizontal Hydraulic Bender for heavy forming, flanging, bending.

WHICH MACHINE MIGHT SOLVE YOUR PROBLEM

BEATTY machines are tailor-made to solve certain production problems — to do a job better, faster, at less cost. And this long and varied experience qualifies our engineers to grasp your problem quickly and to provide a practical, proven solution.

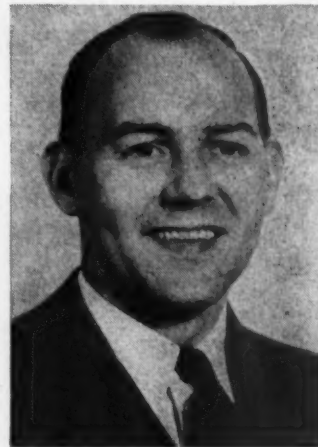
There is a better way to handle most production problems, and our engineers are dedicated to finding that better way. If you have a problem, write us. We have the answer.



BEATTY MACHINE AND
MFG. COMPANY
HAMMOND, INDIANA

way supply field with his own organization at 1101 Vermont Ave., Washington, D. C.

A. M. BYERS COMPANY.—*W. J. Binder* has been appointed manager of the engineering service department of A. M. Byers



W. J. Binder

Company, Pittsburgh, Pa. Mr. Binder has been with the Byers organization since 1946.

Obituary

RALPH J. WIEMER, 54, assistant general sales manager of the Lamson & Sessions Company, died recently of a heart attack.

HENRY F. POPE, 82, who retired in 1945 as a director and board chairman of the National Malleable & Steel Castings Co., died on July 28.

CARTER BLATCHFORD, president of the Blatchford Corporation, Carter-Blatchford, Inc., and Beck & Blatchford, Inc., at Chicago, died on July 27 at Copley Memorial Hospital in Aurora, Ill., after a brief illness.

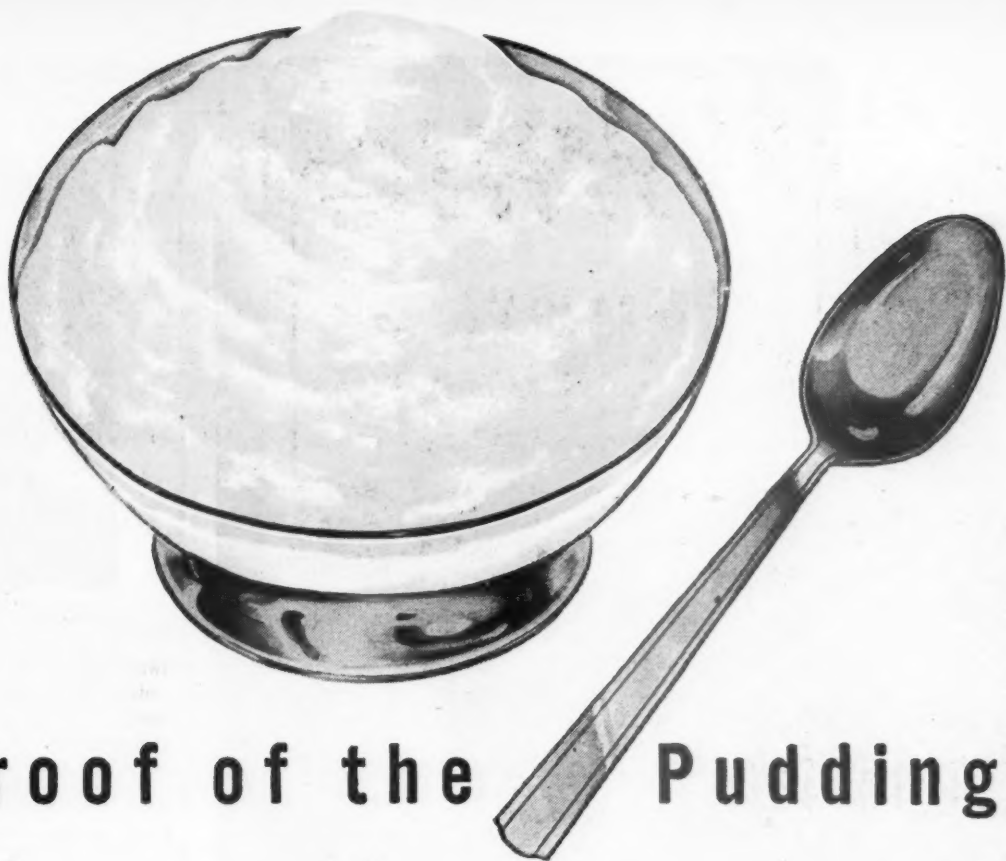
PERSONAL MENTION

General

JOHN W. SHEEHAN, master mechanic of the Chicago, Aurora & Elgin, has been appointed superintendent of shops and equipment, with headquarters at the road's car shops at Wheaton, Ill.

E. L. COOK, assistant to chief mechanical officer of the Seaboard Air Line at Norfolk, Va., has been appointed mechanical engineer at Norfolk, Va.

WILLIAM BRUCE JOHNSON, whose appointment as assistant superintendent of machinery of the Kansas City Southern and the Louisiana & Arkansas, with headquarters at Pittsburg, Kan., was reported in the August issue, was born on April 5, 1907, at Weir, Kan. Following graduation from high school, Mr. Johnson entered railroad service in June, 1925, as a carman apprentice with the K. C. S. at Kansas City, Mo. In 1934 he was appointed assistant mechan-

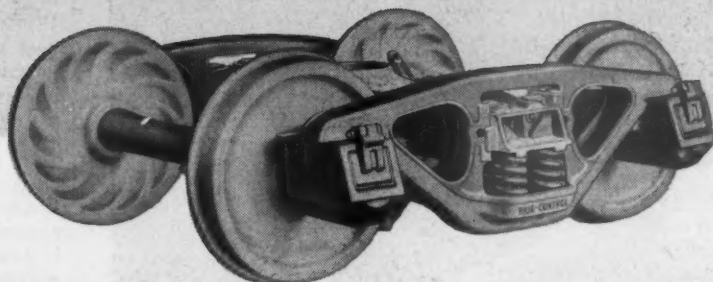


"Proof of the Pudding"

● It's not what *goes into* Ride-Control Trucks, but what *you* get out of them, that counts—smooth operation, freedom from maintenance... protection of rolling stock, lading, *and* roadbed.

Ride-Control Trucks wouldn't now be outselling *all other* freight trucks combined—*two to one*—if they didn't deliver cost-cutting performance that earns profits for Ride-Control users.

A-S-F *Ride-Control*® TRUCK



CONSTANT FRICTION CONTROL • LONG SPRING TRAVEL

AMERICAN STEEL FOUNDRIES

MINT MARK OF FINE CAST STEEL

STACKPOLE
Diesel-electric
BRUSHES

SPECIALISTS
brushes for all types
of rotating equip-
ment for over 20
years.

- A complete line for motors, generators and auxiliary equipment.
- A complete selection of grades to meet the most severe mechanical and electrical requirements of Diesel operation.
- Skilled brush engineers to help select or develop the best grade for your specific application.
- Unique new shunts to guard against shunt breakage.

Stackpole Diesel Brushes are sold only to makers of original Diesel equipment. Replacement brushes can be purchased through these equipment manufacturers.

STACKPOLE
CARBON CO.
ST. MARYS, PENNA.

PUMP AND FLUID DRIVE SEALS BRAZING TIPS
RAIL BONDING MOLDS • CARBON RHEOSTAT DISCS • WELDING CARBONS
ELECTRONIC COMPONENTS • CONTACTS and dozens of other items

ical foreman, and in 1936, mechanical foreman at Texarkana, Tex. From June, 1943, to November, 1945, Mr. Johnson served



William Bruce Johnson

with the 707th Railway Grand Division, and on his return to civilian life rejoined the K. C. S. as assistant to superintendent of machinery.

H. M. NELSON, who has been appointed general mechanical superintendent of the Fruit Growers Express, the Western Fruit Express and the Burlington Refrigerator Express at Alexandria, Va., as announced in the September issue, was born in Missouri in 1907. He entered the service of the W.F.E. as a helper in June, 1925,



H. M. Nelson

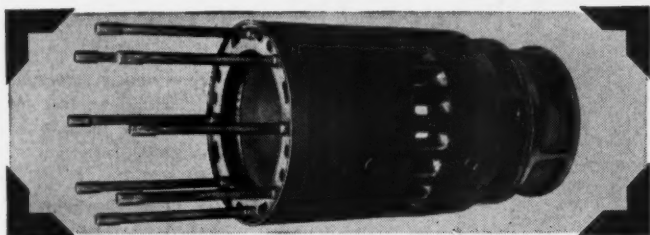
and later filled various shop assignments. He was appointed general mechanical inspector at Wenatchee, Wash., in March, 1936; assistant to mechanical superintendent in September, 1943; mechanical superintendent of the three associated companies in May, 1947, and assistant general mechanical superintendent in February, 1950.

H. J. STEIN, who has been appointed chief mechanical engineer of the Atlantic Coast Line at Wilmington, N. C., as announced in the September issue, was born in London, England, on July 1, 1900. He attended the public schools in England and Montreal (Que.) Technical College, and began his railroad career with the Canadian National at Winnipeg, Man., in 1921. Mr. Stein joined the A.C.L. in January, 1926, as mechanical draftsman

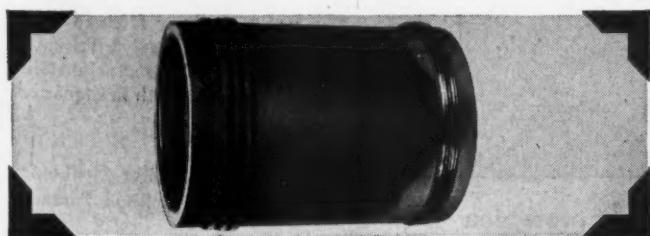
STANDARD ENGINEER'S REPORT

LUBRICANT	DATA <i>RPM DeLo Oil R. R.</i>
UNIT	<i>Locomotive Diesel G.M. 567 B</i>
TRAIN	<i>"California Zephyr"</i>
SERVICE	<i>San Francisco-Salt Lake</i>
FIRM	<i>Western Pacific R. R. Co.</i>

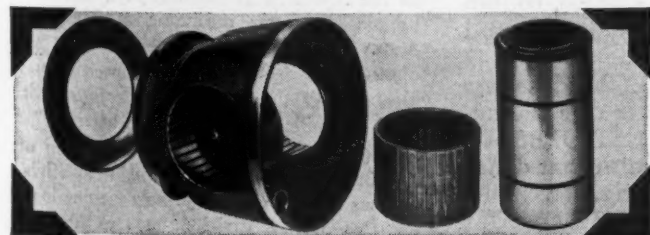
Only 0.002 inch cylinder wear in 1/2 million miles!



515,720 MILES WITHOUT REPLACEMENT of a single part was the record for all 48-cylinder assemblies in a "California Zephyr" diesel locomotive when this one was pulled for inspection. Lubricated with specially compounded RPM DELO Oil R. R., the engines stay in continuous service a full million miles without time off for overhaul!



NO RING TROUBLE or lacquer deposit problems have been encountered in this long service, as this unretouched photo of the piston indicates. The cylinder "miked" only 0.002 inch taper and 0.0005 inch out of round.



WRISTPIN BUSHING IN PERFECT CONDITION! Measurement proved the bushing was still "standard" after the more than 1/2 million miles of service! RPM DELO Oil R. R. will not corrode silver bushings. All parts were put back in service.

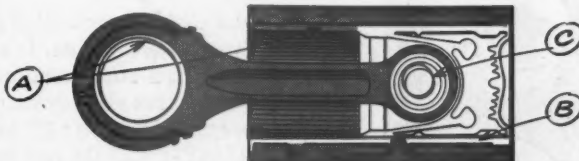


Trademark "RPM DELO" Reg. U. S. Pat. Off.



"THE CALIFORNIA ZEPHYR," new streamliner with Vista-Dome cars, runs daily both ways across the continent. Only 3 diesel locomotives keep it on schedule between San Francisco and Salt Lake.

How RPM DELO Oil R. R. prevents wear, corrosion, oxidation



- Special additive provides metal-adhesion qualities . . . keeps oil on parts whether hot or cold, running or idle.
- Anti-oxidant resists deterioration of oil and formation of lacquer . . . prevents ring-sticking. Detergent keeps parts clean . . . helps prevent scuffing of cylinder walls.
- Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

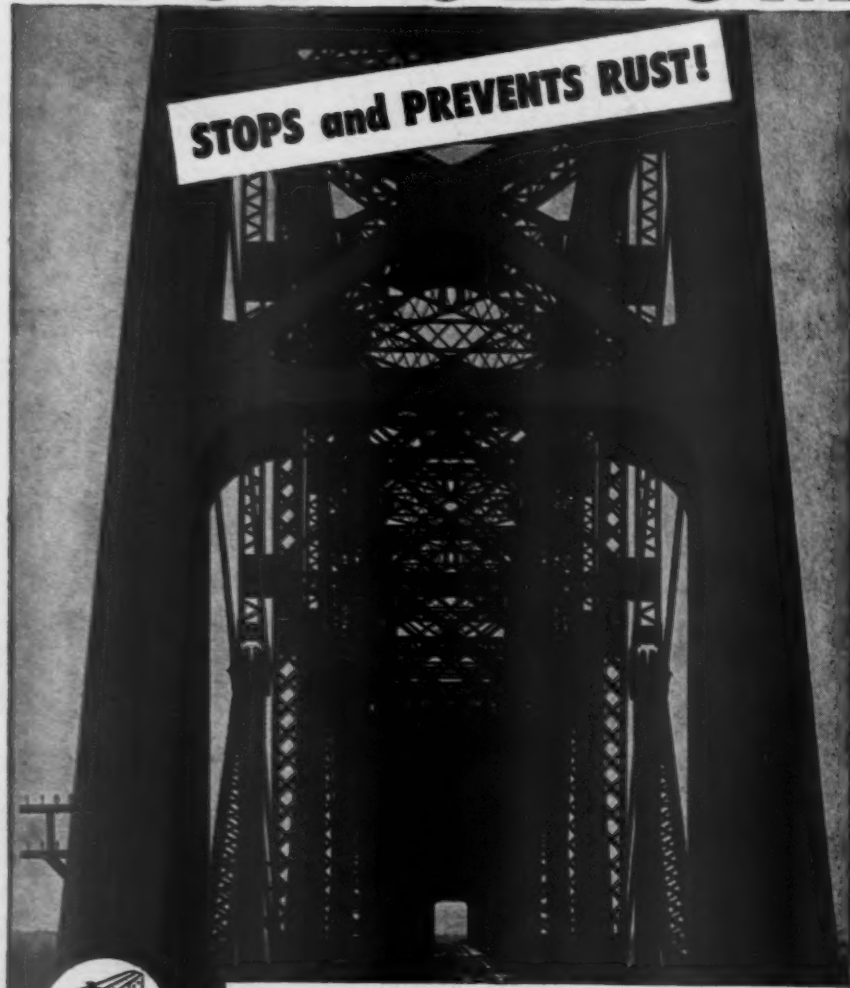
FOR MORE INFORMATION about this or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N. J., Chicago, New Orleans

STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

RUST-OLEUM

STOPS and PREVENTS RUST!



RUST-OLEUM is unequalled for lasting protection against the ravages of rust. It's the practical answer to most railroad rust problems because it can be applied to surfaces already rusted without extensive surface preparation. For 25 years — on major railroads — **RUST-OLEUM** has proved its capacity to stop and prevent costly rust — on bridges, rolling stock, tanks, metal buildings, metal equipment and other structures.

An exclusive formula, **RUST-OLEUM** adds years of extra use to all metal surfaces. It cuts maintenance costs — indoors and out. **RUST-OLEUM'S** tough, pliable film dries to a firm finish that defies rain, snow, salt air, fumes, weathering, etc.

Where rust has already started, **RUST-OLEUM** can be applied effectively and economically. Scraping and wirebrushing to remove rust scale and dirt is all that is usually required. **RUST-OLEUM** merges the remaining rust into durable, rust-resisting coating that protects the metal against the elements. Use it in all your maintenance work on all exposed metal. Specify it on all new equipment or structures to be sure of maximum results at the lowest cost, with assurance of the best foundation coat.

Get the facts! . . . Write for complete data and recommended applications. Tell us your rust problems.

RUST-OLEUM CORPORATION
2591 Oakton Street • Evanston, Illinois



H. J. Stein

at Wilmington, and subsequently served as lead mechanical draftsman, engineer of tests, electrical engineer and mechanical engineer, all at Wilmington.

Car Department

M. L. HYNES, district general car foreman of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis., has retired.

C. C. HIGGINS, general foreman car department of the Seaboard Air Line at Howells, Ga., has been appointed shop superintendent car department at Jacksonville, Fla.

J. J. DRINKA, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been appointed district general car foreman, with headquarters at Milwaukee, Wis.

Master Mechanics And Road Foremen

JOHN L. CHRISTIAN, master mechanic of the Southern at Meridian, Miss., has been transferred to the position of master mechanic at Birmingham, Ala.

RICHARD E. FRANKLIN, general foreman of the Southern at Ludlow, Ky., has been appointed master mechanic at Meridian, Miss.

FRANK UPTON has been appointed master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont.

F. J. SCHLEIHS, enginehouse foreman of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed master mechanic of the Des Moines division, at Des Moines, Iowa.

Obituary

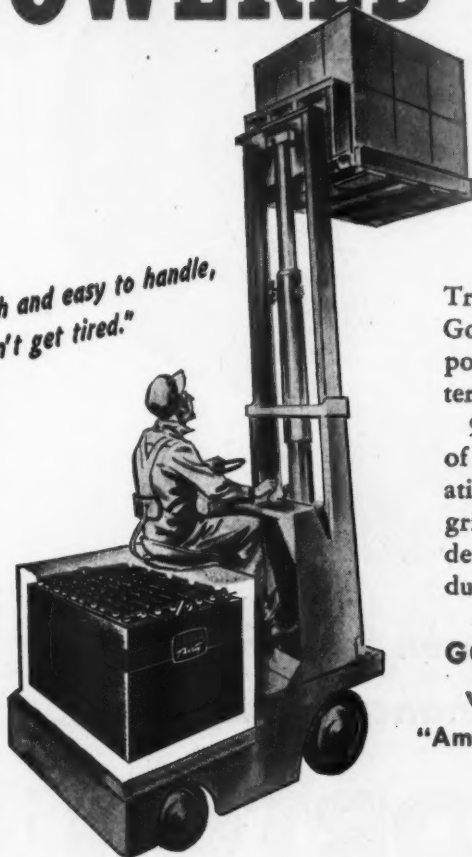
ALLEN A. RAYMOND, superintendent of fuel and locomotive performance of the New York Central System at Buffalo, N. Y., died on August 30 in the Norwalk (Conn.) hospital, at the age of 64.

RALPH W. ANDERSON, former superintendent of motive power for the Chicago, Milwaukee, St. Paul & Pacific, died at the Bethesda hospital, Bethesda, Md., on June 17, after a short illness. Mr. Anderson had been retired from active service since 1941.

It's Unanimous! We All Go For GOULD-POWERED TRUCKS!

OPERATOR:

"So smooth and easy to handle,
I don't get tired."



Trucks really go when powered with Gould "Thirty" batteries—go at full power months after ordinary batteries have begun to slow down.

96% of the entire working surface of Gould's new "Z" Plate is regenerative power-producing material. The grid itself is 66% more resistant to deterioration! Grid porosity is reduced 85%. This is why the—

GOULD "THIRTY" BATTERY
with NEW "Z" PLATES is
"America's Finest Industrial Truck Battery"



PRODUCTION:

"Battery trucks do more work.
Always ready, they position loads
faster, lift and go at the same time."

PERSONNEL:

"Employees like
the quiet, odorless
battery trucks."



SAFETY:

"Battery trucks' floor-hugging stability
and foolproof speed controls
cut accidents."



ACCOUNTING:

"Battery truck cost distribution
is predictable; insurance is lower too."

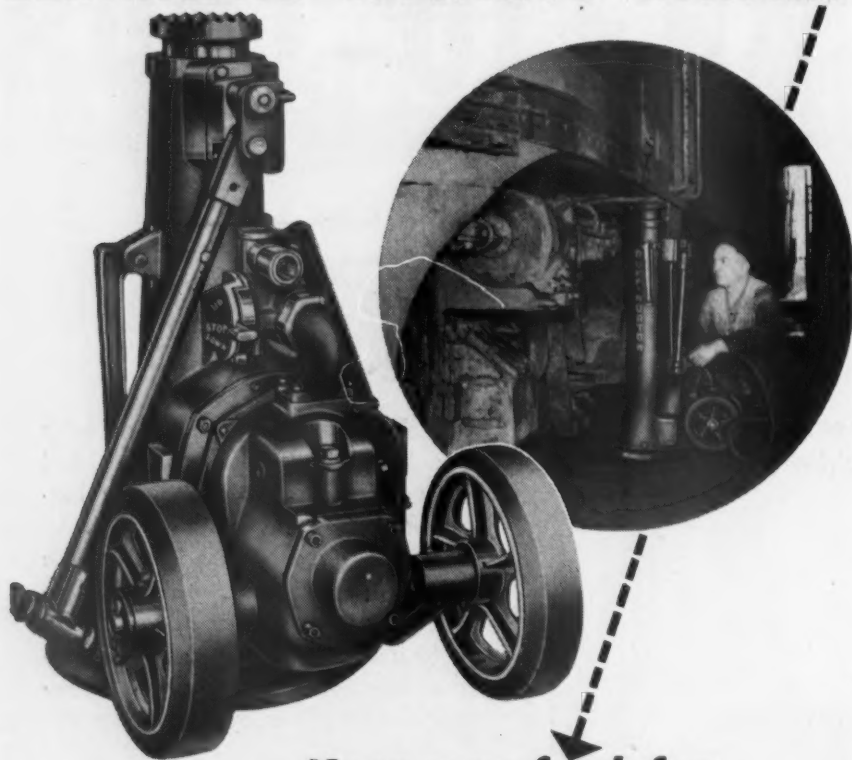
GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC.

NEW YORK, N. Y.

ELIMINATE JACKING STRAIN



Keep men fresh for
repair and maintenance work with

DUFF-NORTON air motor power jacks

All types of locomotives can be lifted and lowered with effortless ease . . . with Duff-Norton Air Motor Power Jacks. Absolutely safe and dependable, they can be controlled to within a fraction of an inch. Easy to spot—easy to handle—they hold loads for long periods of time without danger of creepage or sinking.

QUICK REFERENCE FOR JACK SIZES

Jack No.	Capacity Tons	Height Inches	Raise Inches	Base Diam. Inches	Head Diam. Inches	Weight Pounds
228-R	20	28	18	12	4	238
528-RX	50	28	17	14	5	370
536-RX	50	36	25	15	5	395
126-RX	75-100	26	14	13	6 1/4	448
144-RX	75-100	44	30	18	6 1/4	530

Two Air Motor Power Jacks can be used simultaneously with "Y" connection on air hose.



THE DUFF-NORTON MANUFACTURING CO.

Main Plant and General Offices, PITTSBURGH 30, PA. Canadian Plant, TORONTO 6, ONT.

"The House that Jacks Built"

NEW DEVICES

(Continued)

can easily and quickly be applied to flanged unions without removing the pipe. It fits between the union body and the spring brass ring, which acts as a thrust bearing when used in conjunction with the new gasket. Because there is nothing to remove and nothing to replace when applying the new gaskets, train yard car inspectors can apply it in a matter of minutes, thereby avoiding the necessity of breaking up a train to switch a car to the repair track for broken pipe repairs.

Short or Long Stroke Hammer Control

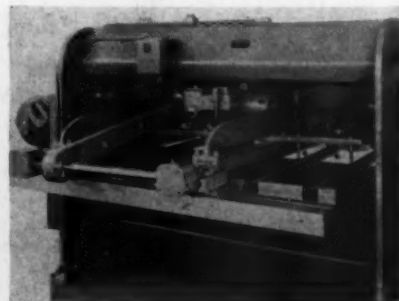
The ability to change from full stroke to short stroke or vice versa at the will of the hammerman is provided in the Ceco-Drop short stroke control announced by the Chambersburg Engineering Co., Chambersburg, Pa.

This device, an air-operated dog attached to the rocker which controls the action of the valve, can be applied to any Chambersburg Ceco-Drop hammer of 1,000 lb. capacity and up. Pressure on a push button on the treadle changes the stroke.

It can be arranged so that the short stroke is the normal stroke, with pressure on the treadle push button changing to long stroke, or it can be applied so that the long stroke is the normal stroke with pressure on the treadle push button changing to the short stroke. Release of the button reverts to normal stroke. The sequence of blows is uninterrupted, there is no drag and both the short and full strokes fall freely.

Magnetic Sheet Support

This attachment, known as the No-Sag Magnetic Sheet Support, for Cincinnati all steel shears, is designed to make easy the difficult job of gauging light gauge sheets



that sag so much that they do not strike the gauging angle. In a typical example, a 20 gauge sheet extending beyond the knife for 20 in. will sag approximately 5 in., making it impossible accurately to gauge the sheet with the back gauge.

The purpose, of the sheet support is to support the sheet to be sheared, so that it can be pushed against the back angle for accurate gauging.

This magnetic sheet support introduced

a new pair of **GUSTIN - BACON** *Trouble-shooters*

G-B FLEXTITE SPLIT-SEALING GASKETS Reduce Brake Pipe Leakage!



G-B Flextite Split-Sealing Gaskets have been approved by the A.A.R. Committee on Brakes and Brake Equipment for use as a simple and economical means to correct and prevent brake pipe leakage at threaded pipe connections to flanged unions.

It isn't necessary to disconnect the pipe when applying Flextite Split-Sealing Gaskets. Simply back-off the flanged union nut, apply the Split-Sealing Gasket over the pipe between the union body and the brass ring, slide the brass ring in place so that the lug of the gasket falls between the ends of the ring, re-apply the nut and you have a positive seal. The brass ring, when used in conjunction with the Flextite Split-Sealing Gasket, serves as a thrust washer to keep the union nut from backing off in service.

G-B Flextite Split-Sealing Gaskets are rapidly becoming standard "pocket" equipment for Car Inspectors, Rip Track men, and others whose duties include the correction and prevention of brake pipe leakage.

G-B DUST GUARD PLUG RETAINER Reduces Bearing Damage, Journal Damage and Hot Boxes!



The new G-B Dust Guard Plug Retainer holds plugs *permanently* in place—in spite of vibration, car dumping and other severe service conditions.

The new retainer can be used with all types of wooden or fibre dust guard plugs now in common usage. They can be applied anywhere, any time, without disassembly of the journal. No bending, locking or fitting is necessary—the retainer is simply slipped over the plug, and automatically locks as it is driven into place. It can be removed and used over again.

Technically engineered and manufactured of high grade spring steel, the G-B Dust Guard Plug Retainer affords positive locking to both sides of the dust guard well. Careful heat treatment of the steel clip insures performance, long life, and the ability to stand up under several applications and removals.

WRITE FOR ADDITIONAL INFORMATION & PRICES

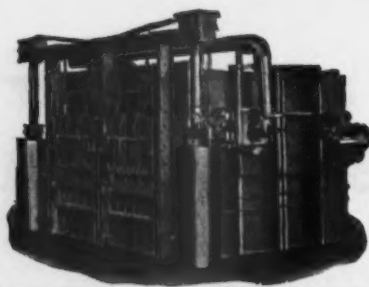


GUSTIN-BACON MANUFACTURING COMPANY

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NEW YORK • CHICAGO • PHILADELPHIA • SAN FRANCISCO • LOS ANGELES • BOSTON • CLEVELAND • PORT WORTH

To Serve
STEAM HAMMERS
FORGING PRESSES
BULLDOZERS



JOHNSTON

DOOR TYPE FORGING FURNACES

Johnston Door Type Forging Furnaces are unusually rugged, featuring heavy frame steel cased construction with walls 13½" or 18" thick. There is ample venting, and uniform distribution of heat. Johnston Reverse Blast low pressure

burners for oil or gas assure rapid heating, and low cost of operation. Sizes and door arrangements built to suit. Send information on work to be done and we will be glad to make our recommendations.

OVER THIRTY YEARS EXPERIENCE IN THE DESIGN AND
 MANUFACTURE OF

BURNERS BLOWERS FURNACES RIVET FORGES
 FIRE LIGHTERS TIRE HEATERS ALLIED EQUIPMENT

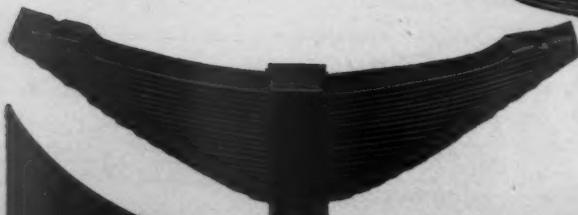
JOHNSTON

MANUFACTURING CO.
 2825 EAST HENNEPIN AVE.
 MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

**GOOD RIDING
 BEGINS WITH
 GOOD SPRINGS**

**AMERICAN-FORT PITT
 SPRINGS**



AMERICAN-FORT PITT

Spring Division

H. K. PORTER COMPANY, Inc.

McKees Rocks, Pennsylvania

by The Cincinnati Shaper Co., Cincinnati 9, Ohio, is built with permanent Alnico magnets, with a unique roller arrangement that provides easy handling when feeding the shear. There is no noticeable drag on the sheet due to the magnetic holding, and the back pieces will automatically strip off as the piece is cut. When cutting plate, the magnets can be raised to eliminate wear and possible damage.

The support is designed to handle all magnetic materials up to 16 gauge thickness and can be supplied with either 36 or 48 in. back gauging range.

Belt-Driven Generators

A.C. generators in 3- and 5-kw. sizes, that can be belted to any available power unit, have recently been announced by Fairbanks, Morse & Co., Chicago.



They are of the four-pole, self-excited type designed for operation at 1,800 r.p.m. Type HF synthetic enameled wire is used in the winding of both the armature and field coils, and the wires are further impregnated with insulating varnish, oven-baked. All windings are finally covered with Glyptal to make them moisture-proof. Ventilation openings are screened. The frame of the generator is of drip-proof construction for service when exposed to the weather.

Two Twistlock receptacles are furnished with the 3-kw. units and three with the 5-kw. units. A convenient slide rail also makes it possible to adjust the belt tension after the tractor or power unit has been spotted in place.

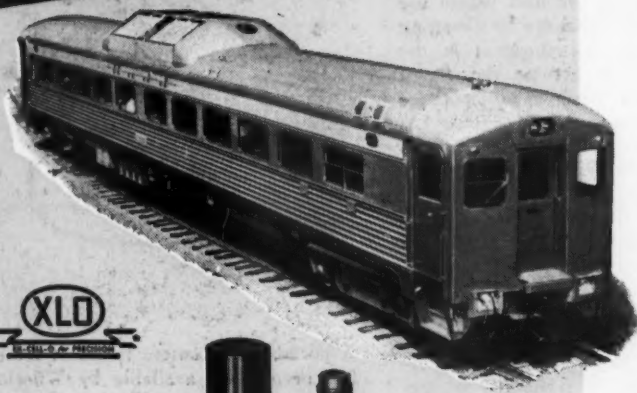
Dry Chemical Fire Extinguisher

Another contribution to safety in fire fighting has been added with the manufacture of the dry chemical type fire extinguisher by the C-O-Two Fire Equipment Co., Newark 1, N. J. This extinguisher is a self-contained unit of rugged construction with no extra gadgets protruding or complicated operating parts. The activating mechanism is totally enclosed within the body of the device and is protected against possible damage.

The dry chemical is a finely pulverized

GOING PLACES...

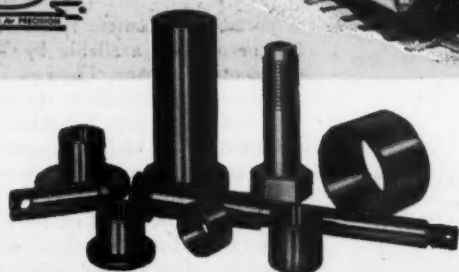
BUDD RAIL DIESEL CARS WITH PINS AND BUSHINGS BY EX-CELL-O



An outstanding feature of the new Budd RDC Rail Diesel Car is the Budd disc brake. By eliminating direct wheel contact, this brake increases wheel life; decreases maintenance.

Ex-Cell-O pins and bushings are used throughout the Budd disc brakes on the RDC. The choice was a natural one—for Ex-Cell-O pins and bushings consistently wear better; last longer. Records of more than a million miles of service between shoppings are not unusual.

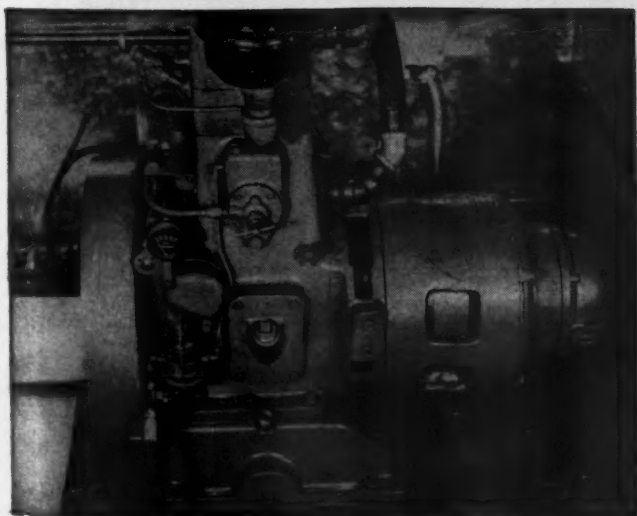
For your new or reconditioned equipment, standardize on Ex-Cell-O pins and bushings. Sizes for steam and Diesel equipment are listed in Ex-Cell-O Catalog 32381. For your free copy, write Ex-Cell-O Corporation today on your company letterhead.



Railroad Division
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

50-33

Speed up Freight Movements with Diesel-Powered Radio Communications



Witte Dieselectric Plants are compact — require little valuable space in a caboose. They are available from 3 to 10 KVA-AC, 2.4 to 8 KW-DC.

Radio communications systems . . . with Witte Dieselectric Plants furnishing the power supply . . . have been developed to the point where through trains can handle single-car, way-station movements and still shorten between-terminal time.

For example, on a large Southwestern railroad, the installation of end-to-end radio has saved an average of two hours and 40 minutes on a single-track, 280-mile mainline run.

Because of continuous power, the handling of this class of movements, through radio, becomes really practical . . . with the proven reliability found only in Witte Dieselectric Plants.

Witte has had wide experience in making Dieselectric Plant installations for communications . . . as well as refrigeration, lighting, cooking and signaling . . . on many of the nation's leading railroads. Our railroad sales engineers will be glad to discuss with you installations on your line; there's no obligation.

WITTE ENGINE WORKS, Kansas City 3, Mo.

Division of Oil Well Supply Company



WITTE DIESELECTRIC PLANTS AND DIESEL POWER UNITS

UNITED STATES STEEL

FOR POSITIVE LEAK-PROOF DIESEL FUEL LINE CONNECTIONS **RECTORSEAL**

Available
in complete
size range
and brush
top cans.



Proved in use by major companies in the Oil Industry for 13 years—tested in the field wherever threaded, gasketed or coupled connections are required. Rectorseal is the *safe* leak-proof sealant—prevents waste of fuel, reduces fire hazard.

It maintains its plastic elasticity for the life of the connection; never dries out or gets hard and brittle. It's easy to apply. It's economical. It's insoluble in oil, water and all petroleum fractions. Order Rectorseal today. Test it in your own shops. We'll gladly send a free sample.

Write **RECTORSEAL** Dept. M
2215 Commerce St. Houston, Texas

RECTORSEAL
Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas

powder and consists of sodium bicarbonate and other chemicals which remain free flowing while being used. When this chemical comes in contact with fire, it absorbs a greater part of the heat which in so doing instantly decomposes the fine powder particles and releases fire-killing gases.

Among the many features are: no syphon tubes or valves within the cylinder to become clogged or inoperative; discharge hose and squeeze type discharge nozzle remain empty until the extinguisher is actuated; inverting the unit before use provides mechanical breakage by changing the position of the dry chemical in the cylinder; bumping to actuate the device provides additional mechanical breakage as well as continuous carbon-dioxide gas pressure agitation or fluffing of the chemical.

To fit various fire-fighting needs, these units are available in 20 and 30 pound capacity sizes. Three different type brackets are available for each size—a wall hook, wall bracket and a running board bracket if the extinguisher is to be installed on running or moving equipment.

For recharging, no special tools are required. They can be recharged on-the-scene by anyone.

Fire Resistant Plastic Car Flooring

A western railroad has in service a total of 70 box cars in which the floor covering has been surfaced with oxychloride, a smooth,



durable and fire-resistant plastic. The first application was made experimentally in December, 1947, by the Westvaco Chemical Corp., Newark, Calif.

After observation for 11 months, inspection revealed that although the car had been subjected to heavy loads requiring considerable floor blocking, lading had included rough equipment such as discs, harrows, drums and steel beams, and it had been loaded and unloaded with fork trucks, the floor was in good condition.

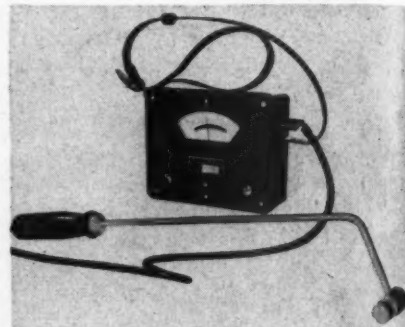
It is impervious to oil, grease and most acids and is not affected by temperature changes. The smooth surface and the absence of cracks and openings simplifies cleaning.

The plastic is applied over a layer of wire bond and can be troweled to any desired finish. The subsequent security of

the lading has helped reduce loss and damage.

The new floor lends itself to bulk shipments of grain. The absence of splinters, nails and worn boards has proved it to be suitable for shipments in paper bags.

Tin Content Indicator for Solder



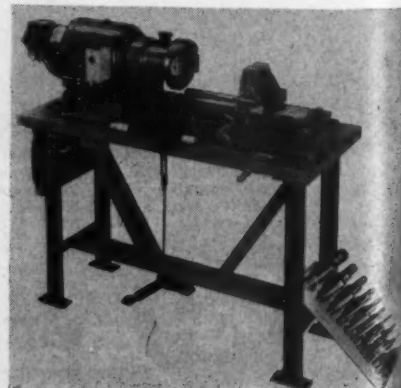
A portable tin content indicator for solder has been made available by Wheelco Instruments Company, Chicago. It provides a means of determining the ratio of the lead and tin content in solder. It consists essentially of a high resistance pyrometer and a convenient plug-in type sensing unit.

The method of obtaining the percentage of tin content is based on the difference in temperature between a lead standard and a lead-tin alloy sample, while these materials are passing from liquid to solid consistency. The lead sample is permanently sealed in one of the cups of the sensing unit, while the solder sample to be tested is scooped into the other cup and retained there until reading is obtained.

Hose Line Assembly Machine

Illustrated below is a heavy duty piece of equipment, the Aeroquip hose assembly machine designed by the Aeroquip Corp., Jackson, Mich. It is mounted on a cast iron base plate, equipped with a speed selector, tool steel mandrels, interchangeable jaws and has many other features for high speed production. The unit is small enough to be mounted on any ordinary bench.

While hose lines may be hand assembled,



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We have introduced the Flange Cutter known as FCC-21 to solve the high flange problem. Reports of our demonstrations throughout the Country indicate the acceptance of this tool by the Railroad Industry.

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We deeply appreciate the co-operation and suggestions of the Superintendents, and Master Mechanics, and sincerely hope it will continue.

Yours very truly,

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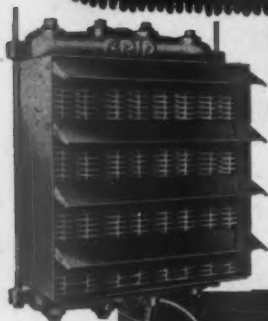
* Fredercik W. MacDonald

*President

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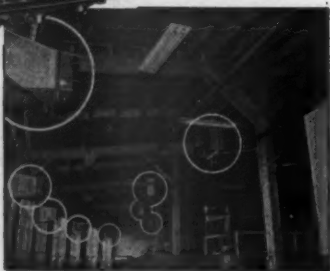
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the model F-1766 unit, will enable users to make their requirements of specific lengths of hose line on a short notice and on a production basis up to 600 per cent faster than by hand operations.

The assembly will accommodate all types of standard Aeroquip fittings including male pipe, swivel, flange and elbow type, allowing for greater use of bulk hose and fittings. It is also claimed that the unit will permit quick salvage of large stocks of hose lines that cannot be used for one reason or another.

Shunt Connection for Carbon Brushes

The United States Graphite Company Division of the Wickes Corporation of Saginaw, Mich., has announced the development of Statite, a completely new permanent shunt connection for carbon brushes.

The manufacturer claims that Statite is



the first shunt connection that is actually permanent and that tests made under severe operating conditions have shown that Statite cannot be pulled or jarred loose from the brush, will maintain the original low millivolt drop, will not oxidize, and is unaffected by extreme operating temperatures.

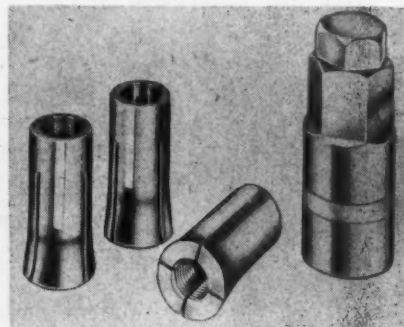
Stud Pullers

Snap-on Tools Corporation, Kenosha, Wis., has recently announced the addition of two series of threaded collet type stud removers and inserters. The smaller size unit has 14 different collets available to handle studs from 1/4 in. to 5/8 in. in diameter and the larger model has 6 collets for 3/4-in. to 1-in. diameter studs. Both models come in fine and coarse thread sizes.

The correct thread size collet to fit the thread of the stud is inserted in the housing, and the whole unit is then threaded over the stud. Turning the bolt on top draws the slotted tapered collet up into the housing, compressing it and locking it onto the stud threads with a slip-proof grip. The collets are all keyed to prevent them from turning inside the housing. Once the tool is locked onto the stud the whole assembly becomes a rigid

unit that can be turned with a socket, Boxocket, or open-end wrench. As the collets fit the threads the pull is directly from the threads without damage to the studs.

The grip exerted with this tapered collet principle right at the end is said to be



powerful enough that studs may be removed or reset if only two or three threads are left exposed. Studs broken off below the thread portion may be threaded and then removed with these tools in the usual manner.

A feature of these tools is their ability to operate in restricted areas. Outside diameter of the small unit is 1 3/8 in., the larger unit 2 1/8 in. Both turn on center and can be used where very little clearance exists between the stud and surrounding obstructions.

A.C. Transformer Welders



Hobart Brothers Company, Troy, Ohio, is announcing a new line of transformer type a.c. arc welders which have no moving parts. Welding current values are set easily by means of an electrically adjustable reactor. Two models are now in production and available for delivery. Model TSP-205-C with power factor correction is rated 200 amp. at 300 volts. Model TSP-182-C with power factor correction and limited input for operation on REA lines is rated 180 amp. at 25 volts.

Control of the five main taps of weld-

Designed to utilize high strength low alloy steel containing nickel, the body of this car provides minimum weight without sacrificing strength or safety.



High strength low alloy steels

containing *Nickel*

Reduce Bulk and Deadweight

of air-conditioned commutation cars . . .

Carefully look at rolling stock designed to take full advantage of high strength low alloy steels containing nickel.

This type of steel permits the builder to strengthen fabricated structures, and to reduce bulk and deadweight, because thin light sections of these steels provide the same strength and ruggedness as thicker, heavier sections of plain carbon steel.

In addition, by resisting impact, wear, abrasion and corrosion, the nickel alloy steels substantially lengthen equipment life. Moreover, they can be fabricated as easily as carbon steel, and often decrease unit-labor costs.

In the commutation car, shown above

. . . one of the first electric-powered, self-propelled cars produced by the St. Louis Car Company on a 100-car order for the New York Central System . . . nickel-containing alloys play a vital role.

All bodies are of high strength low alloy steels containing nickel. Truck frames are cast in 2% nickel steel, and the "tightlock" couplers are also cast in nickel steel. Roller bearings, furnished by Timken, SKF, Hyatt, and Fafnir, also utilize nickel alloyed steels. Door handles and coat hangers are of nickel silver, and chromium-nickel stainless steel is widely used throughout the interiors.

Nickel-containing alloys may help save money *day-after-day* by reduc-



Applications of austenitic chromium-nickel stainless steels include moldings, seat edging and arms, electric heater guards, and toilet floor plates. Each car, built to provide new conveniences for 130 passengers seated on one level, uses a 48-cell Edison "A4HW" nickel-iron-alkaline storage battery.

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ing bulk and deadweight. They help cut maintenance costs by minimizing wear and corrosion. Consult us on their use in your equipment.

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... Can Save You Time and Money!
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- Delivers 300,000 BTU's per hour at consumption of $2\frac{1}{4}$ gallons of economical fuel oil.
- Produces 1600 CFM at temperatures up to 300 degrees.
- Induced draft vaporizing principle means no fuel pump, filters, atomizers, valves, jets, ignition points nor transformers.
- No poisonous gases or odors.

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ing current from low to maximum is accomplished with a large, easy-to-move hand wheel switch. The switch is heavy copper, moulded in Bakelite, and is mounted on the front panel. Above this hand wheel is the rheostat control knob, which controls the amount of d.c. current flowing into the reactor to give 100 fine welding current settings in each of the five main steps or ranges. Thus, approximately 500 different welding current settings are available.

In addition to adjusting the welding current by changing the relationship between the d.c. flux and the a.c. flux in the reactor core, the rectified (d.c.) current has the effect of regulating this relationship at the time the arc is struck to provide a higher than normal current at the arc for a fraction of a second. This gives the operator an instantaneous striking arc.

By connecting the rheostat to the reactor circuit through a standard plug and receptacle, remote control is made possible. The rheostat can easily be removed and used at a distance from the welder by merely inserting an ordinary extension cord with standard plug and receptacle.

A toggle-type switch is provided on the control panel for disconnecting the transformer from the power line. There is a light on the panel to signify that the set is on or off.

Model TSP-205-C is designed to operate on single-phase, 60 cycles either 220/440 dual voltage, or 550 volts. Model TSP-182-C is designed to operate on single-phase, 60 cycles, 230 volts, to comply with the REA specifications for welders used on its 3 kva. transformers. Steel casters are standard equipment.

Hidden Arc Welding

The submerged-arc welding process employs welding current densities on $\frac{5}{16}$ -in. electrode wire which melt the electrode at speeds comparable to using 10,000 amp. on

standard $\frac{5}{16}$ -in. diameter coated hand electrode.

Submerged-arc welding equipment for either a $\frac{3}{32}$ -in. or a $\frac{5}{64}$ -in. diameter electrode wire is being offered by the Lincoln Electric Company, Cleveland, Ohio. Welding currents up to 600 amp. are used with these wires which, on the small cross-sectional area of the wire, produce extremely high current densities. These high densities create a deeply penetrating arc which in turn allows the use of high welding speeds. This also means that in general little or no edge preparation of joints is required, and therefore less weld metal is used in completely fusing the joint.

A "Manual Lincolnweld ML-2" unit for the "Hidensity" process may be used with a 600 or 900-amp. welding generator. This unit provides all the features of an automatic head and is completely self-contained so that it can be moved to the work independently of the welding generator. It can be operated any practical distance from the generator, and because of its flexibility and portability, it can be used on all types of flat and near flat work.

The unit consists of a control case, wire reel case, conductor cable and welding gun. The control case contains a wire feed mechanism, consisting of a variable speed d.c. motor, geared to drive rolls plus an on-off switch, inch button, arc voltage rheostat and current relay. The wire reel case is connected directly to the control case but may be separated from the controls for special applications. Coils of wire are centered at all times on the reel, which is easily removed for loading.

The feed mechanism automatically feeds wire at a preset arc voltage from the reel through the conductor cable to the welding gun. It is fed through the gun to the work. The gun holds inorganic granular flux which is deposited around the high density arc, completely covering the arc and crater as the gun is moved over the joint being welded. The welding gun is moved either by hand or by attaching it to a mechanized carriage of the cutting torch type.

